A New, Enlarged, 2nd Edition!

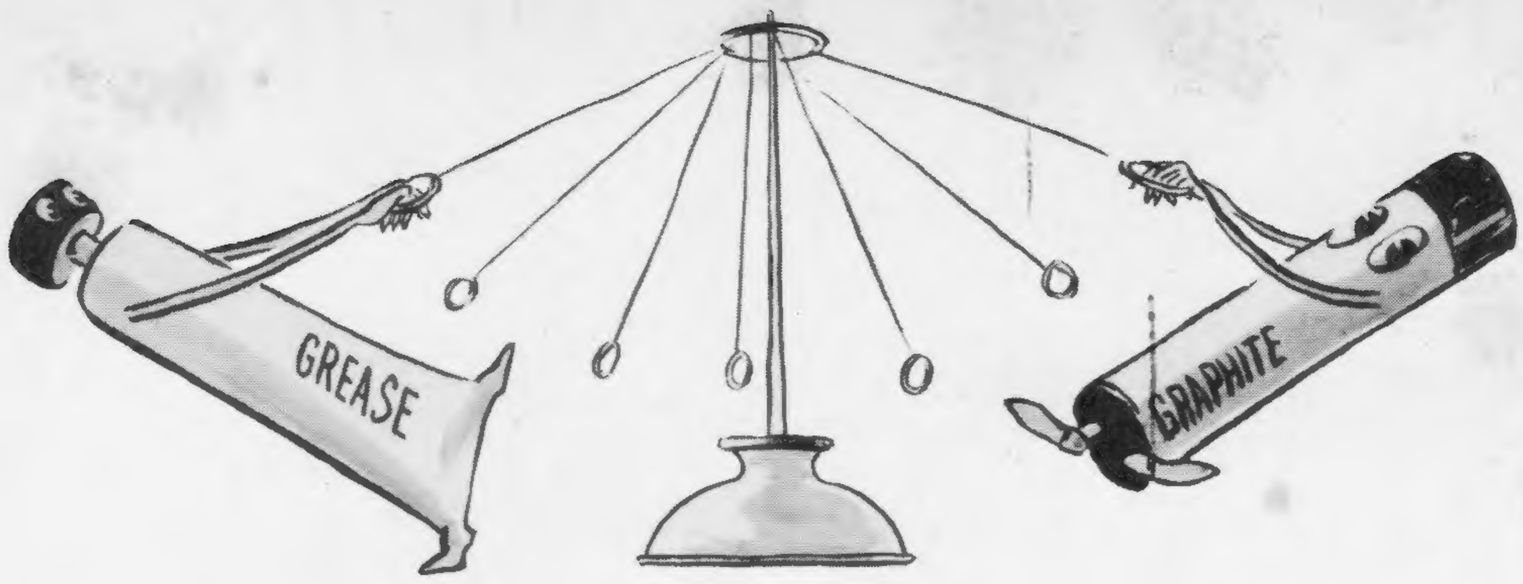
1955 PRINTING

$1.00

It's Easy
TO FIX YOUR BIKE

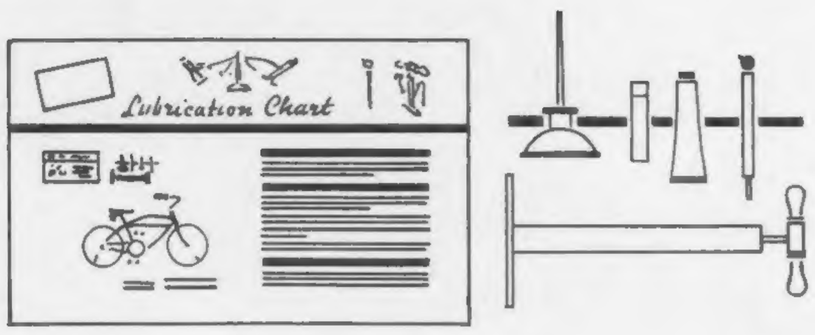
WITH 355 SEQUENCE PICTURES

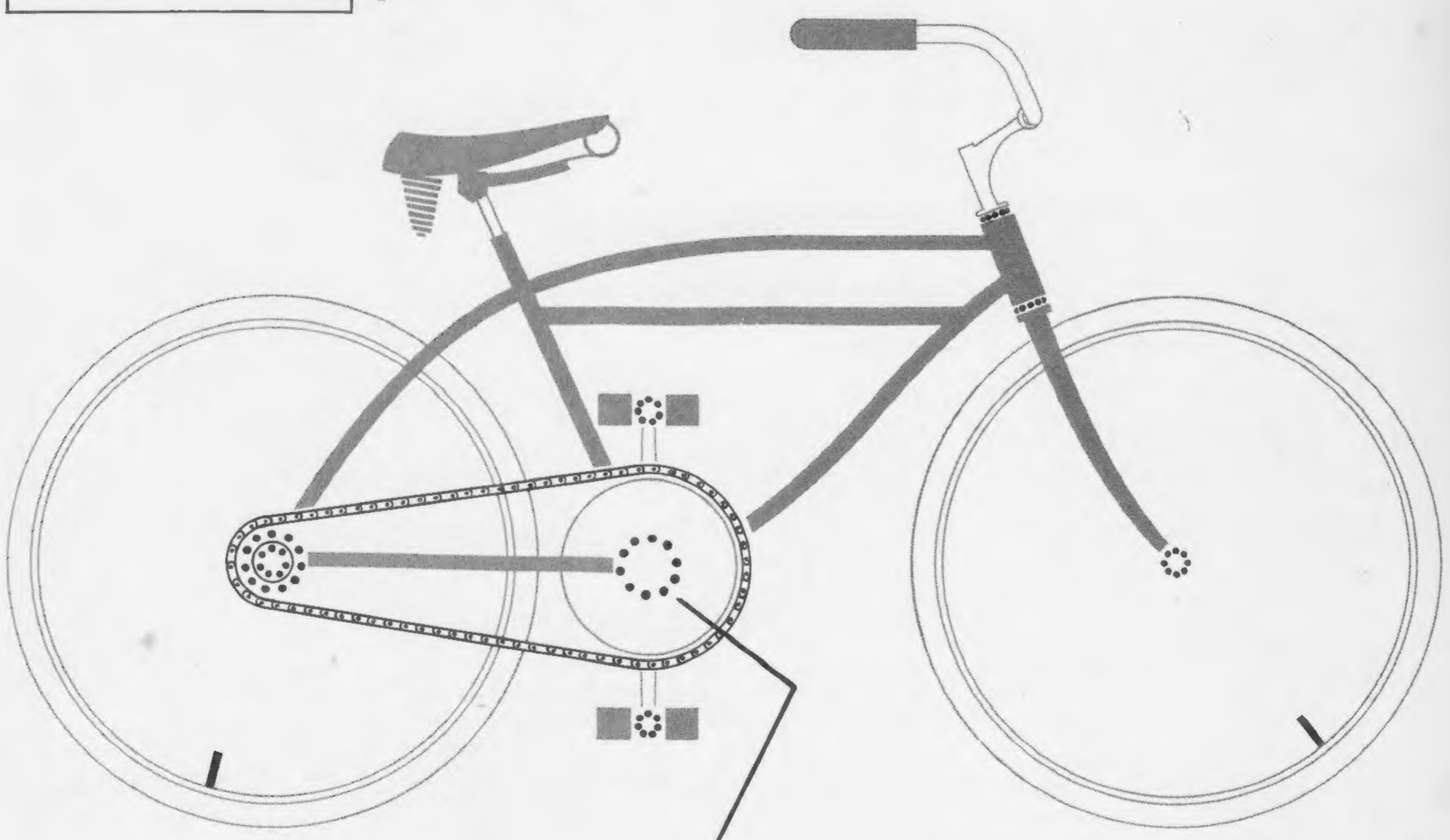
by John W. McFarlane



Lubrication Chart

Put this chart on the wall along with a Bike Maintenance Rack containing Ball Bearing Lubricant or Vaseline, Stick Graphite, Oil Can of SAE 30 Oil, Pump, and Tire Gauge.





Note your serial number. Write it here. ➡

Bikes are sometimes lost, strayed, or stolen.

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TO FIX YOUR BIKE

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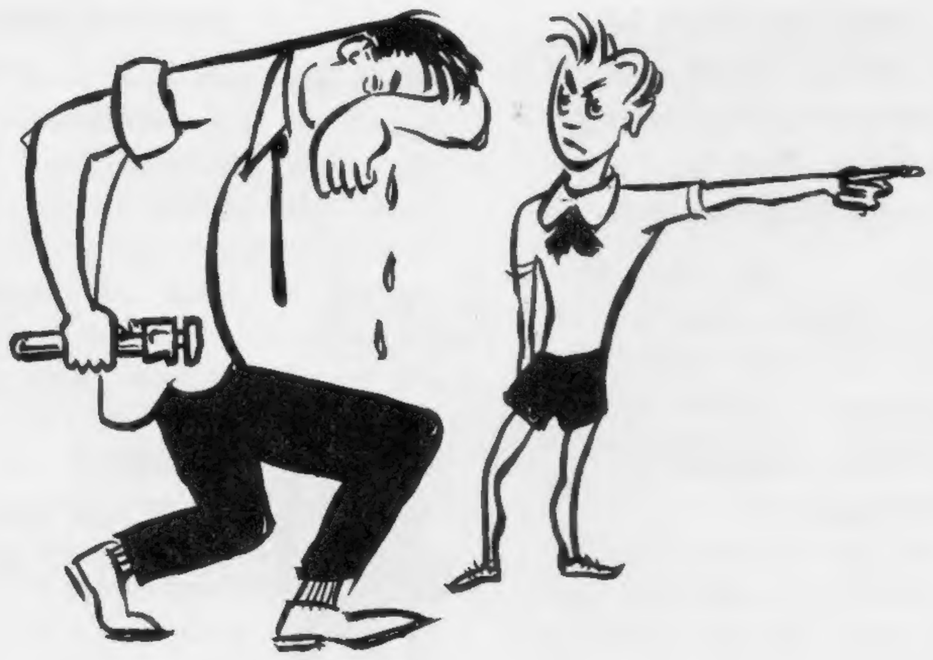


This book is fervently dedicated to the harassed fathers of America and their tinkering offspring.

1955 Printing

WILCOX & FOLLETT COMPANY

1255 SO. WABASH AVE., CHICAGO 5, ILL.

Contents

ALL GREASE IS NOT GREEK!

The Steerage

Keep 'em Rolling

To Make You Go

To Make You Stop

Bang!

Glamour!

How to Butcher a Bike—Turn the Book Over!

Printed in the United States of America

It's Easy to Fix Your Bike

by John W. McFarlane

THIS BOOK doesn't start by telling you how to select a bike. You have selected it, or somebody did. You have it now, and it's busted. Otherwise you would not have bought this book! Maybe you never fixed a bike before, but you can probably do it, with our pictures. Brother Joe learned about tanks and planes from pictures—lots of pictures. We use the same picture tricks here—sequence shots, exploded views, diagrams, and so on. So go to it—but work on a pedal first if mechanical stuff is new to you. DON'T start on a coaster brake.

YOUR INITIATION

Start to repair something on an old bike, and you get drawn into a string of repairs. You have a flat back tire, say. Off comes the back wheel to dunk-test the tube. Now you can fix that rattling fender—better still, off it comes to take the dents out. Now that the tire is off you can replace missing spokes—oh yes—and true up the wheel. And now it's easy to get into the brake; it was sluggish anyway. Oh, oh, what a mess! So you clean it up, and find a bad bearing. The chain—it's off, and it seems very dry—so it gets cleaned and oiled. Now you need to repair and replace that chain guard to keep the oil off your pants. The crank bearing seems too loose and dry. So off it comes—more cleaning and greasing.

Let's see—this was to be a 20-minute job on fixing a flat. You did the right thing in fixing the rest. It certainly needed it, and now the bike is easier, more pleasant, and safer to ride. But don't say we didn't warn you! Why did this happen and what should you do? It happened because very few of us give our bikes any attention until something goes wrong. We might as well admit it. This has developed a wonderfully resistant design in bicycles, but even so, it isn't a good idea. An annual overhaul saves a lot of trouble. When we look closely at a neglected bike, it does need lots of attention, even if it still runs. That's why bicycle repairmen want to do more work than you request. They are only being conscientious in putting things right. So—don't get drawn into an overhaul some evening or Sunday if you need the bike next morning. Start pulling down a school-going bike on Friday, so you can get the needed parts on Saturday. Repairs will take longer than you think, and you will need parts—bicycle parts, not makeshifts.

That brings up another thing. One of the best ways to waste time is to work without the right tools and parts. Don't use miscellaneous nuts and bolts—or improvise parts. Take the broken or worn part to a bike or hardware store, or if it's a mail order, give full information requested by the catalogue. Be sure to get one exactly like it. So get the tools and allow time for the overhaul, and time to get parts.

There is a catch to any repair job. Things don't go just like the book says. Some nuts are rusted on tight, some threads are banged up, bolt heads are so butchered you can't get a wrench on, the wrenches you have are the wrong size, parts are missing, or your bike differs from the pictures. A bike that needs repairs is generally several years old, is second-, third- or fourth-hand, and a bike butcher may have done his worst. So you will have to add your ingenuity to our instructions.

Another catch in a repair job—it may not be right the first time you do it—so go at it again, thinking about it, and charge the extra time to your education. The biggest thing you gain from doing anything new is the ability to do something bigger.

If your time is worth anything, don't do repair jobs just to save money. You should know how to cure a sick bike, but take the patient to a bike doctor for serious ills, or when your time is needed elsewhere. Your bike repairman has years of know-how, and won't overcharge you.

This book covers the main things that need attention on the average American Bike. It does not cover the continental bicycle. For rim brakes, three-speed hubs, and other things about touring bicycles, bicycle camping, and so on, see "Bicycling" by Ruth and Raymond Benedict (A. S. Barnes and Co.).

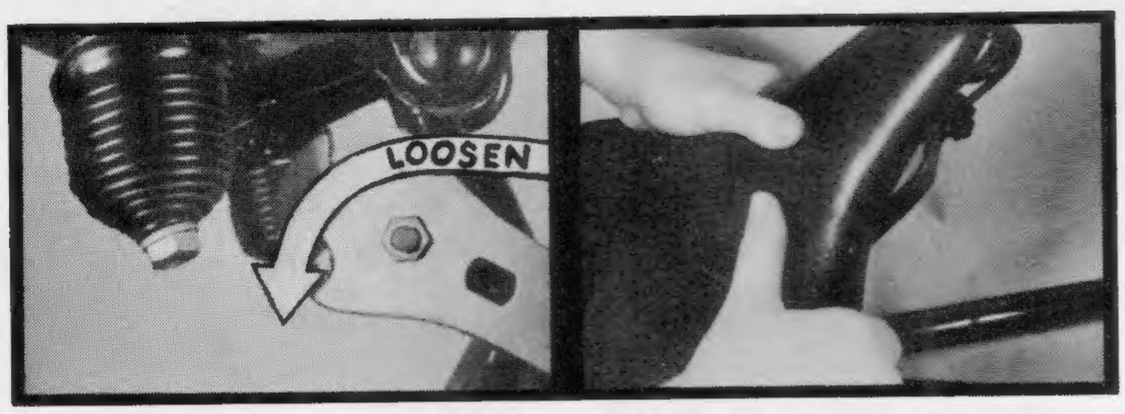
The publication of this book will probably result in the damaging and destruction of a number of bikes. But it should result in better condition of thousands of bikes. Most important, if it awakens and encourages mechanical ability in boys and girls, the gain far outweighs the loss. This same mechanical ability has helped the New World to lead in peace and war, and it is natural that young people's mechanical teething be on their first mechanical possession —the bicycle.

Illuminated by Sherman E. Nelson

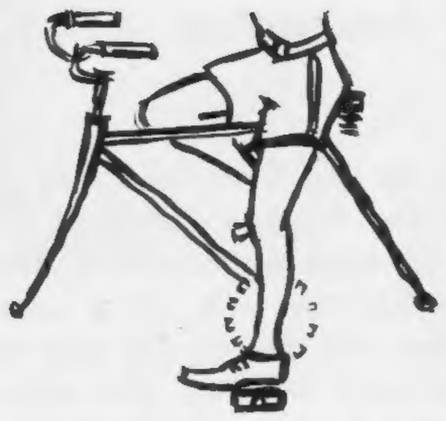
Saddle and Handlebars

Wrong saddle height tires your legs, wrong saddle tilt keeps you pushing or pulling on the handlebars. Saddle posts and clamps differ, but they all adjust the same way. Adjust your saddle first for leg length, leave it tilted up slightly. After adjusting handlebar height, if you find yourself pushing the handlebars, tilt the saddle more, if pulling, tilt it less. Replace broken saddle parts, or you're headed for trouble.

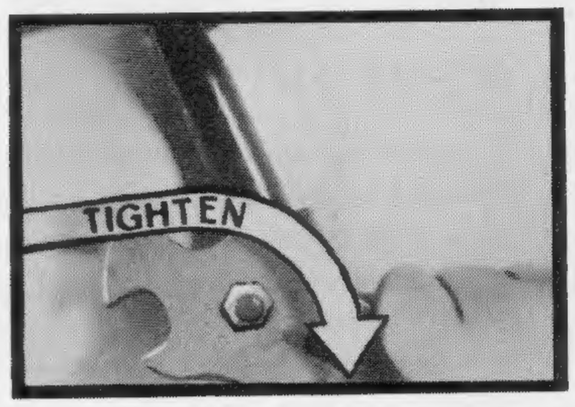
TO CHANGE SADDLE HEIGHT



1 To raise or lower the saddle, loosen the seat post nut on the bike frame, just below the saddle.

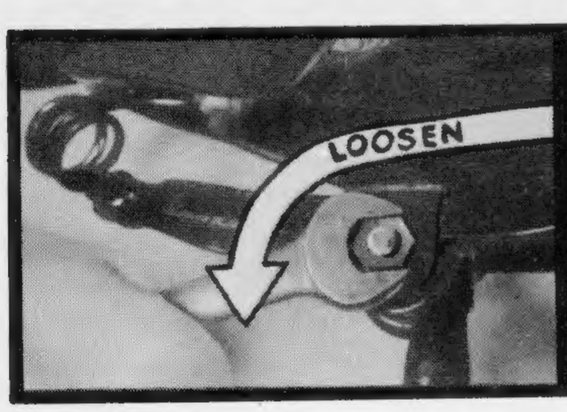


2 Stand over the rear wheel, raise or lower the saddle while twisting it side to side. Tighten the nut slightly and try the saddle—your heel, with leg straight, should just rest on the pedal as you sit squarely on the saddle.

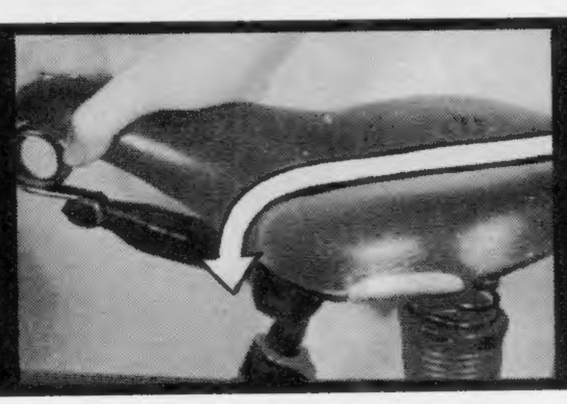


3 Tighten the seat post nut very tight, with the right wrench. Don't use a pliers, it will butcher the nut. Easy, wasn't it?

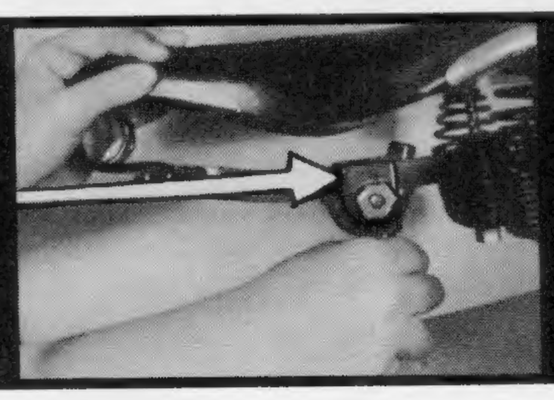
TO TILT OR SLIDE SADDLE



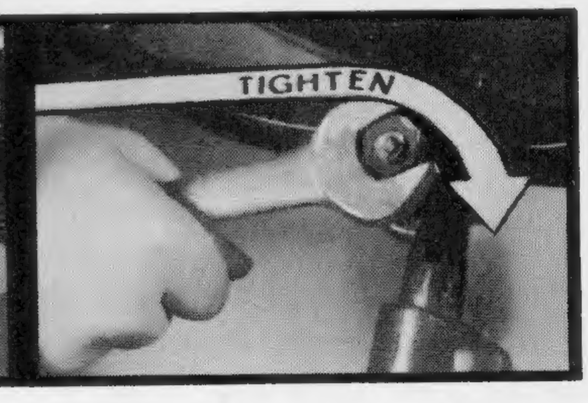
1 Loosen the nut on the saddle clamp. This clamp holds the saddle on the saddle post. Push the front up if you tend to slide forward.



2 If you have been pulling on the handlebars, push the front of the saddle down to here which is about right. Move it more if needed.

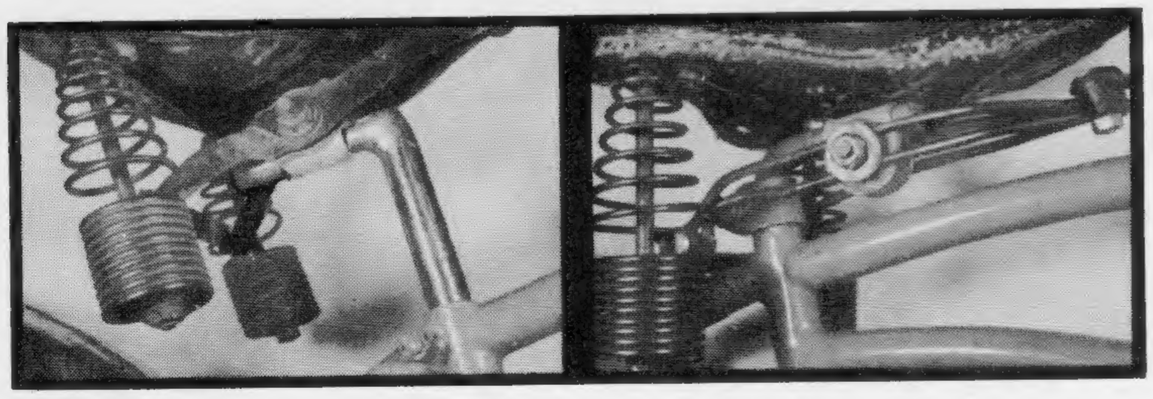


3 Slide the saddle back if you have been too near the handlebars (other way, Shorty!). The saddle front should be over the crank center.



4 Tighten the saddle clamp nut very tight. After adjusting handlebars, ride the bike. If the saddle needs final adjustment, make it.

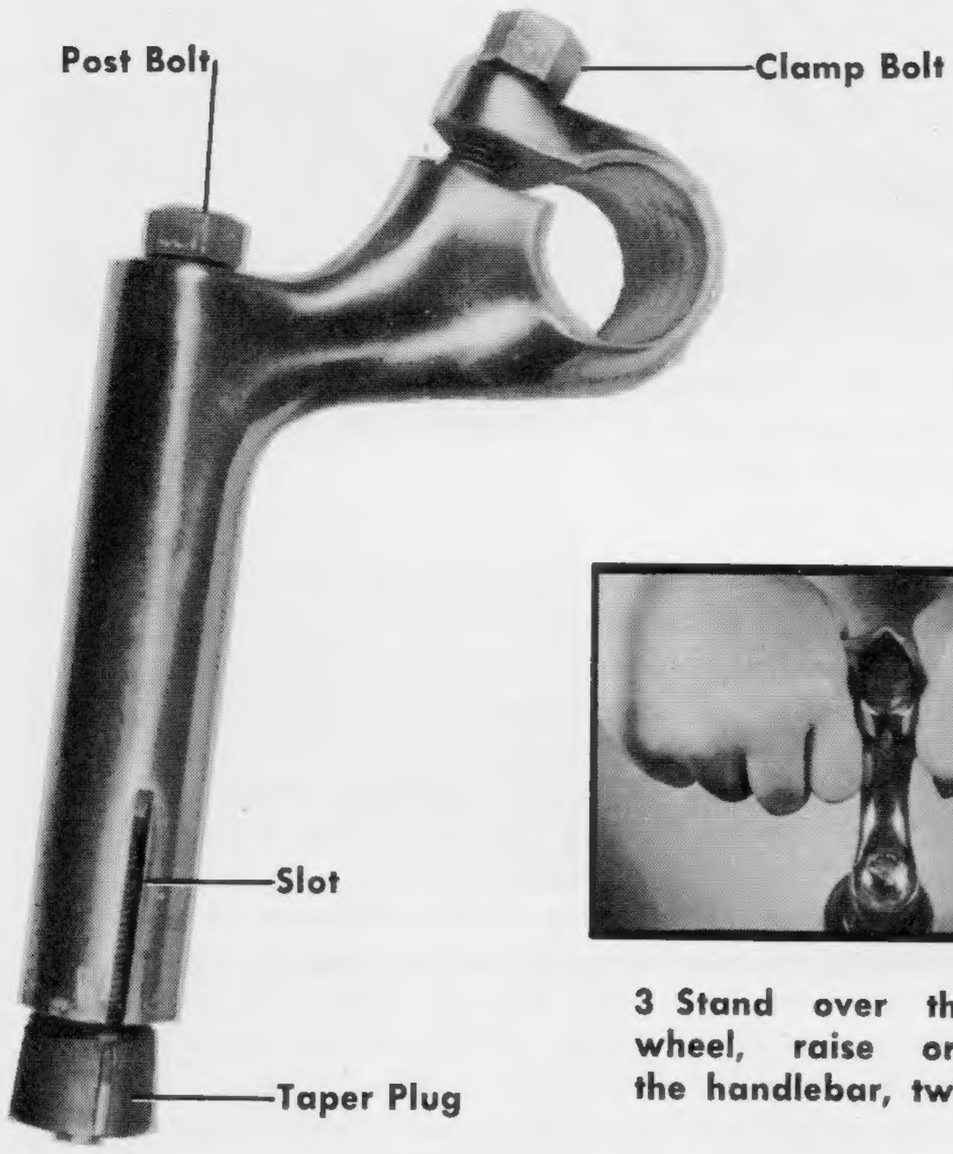
BIG OR LITTLE RIDER?

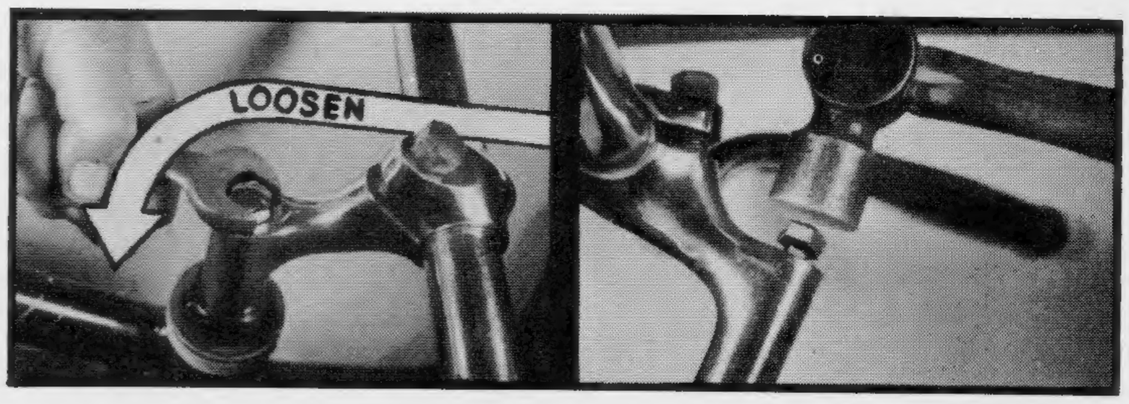


1 If you are too big for your bike, and have an "L"-shaped seat post, raise it and turn it backwards. It's time that bike went to Kid Brother!

2 But you, Shorty, turn the post forward and turn the saddle clamp upside down. If you still can't reach the pedals, put blocks on them.

ADJUSTING HANDLEBARS





1 To raise or lower, loosen the handlebar post bolt.

2 Tap the bolt down to drive out the taper plug.

If you loosen the post bolt so much the plug falls off, pull out the post, turn the bike over so the plug falls out.

3 Stand over the front wheel, raise or lower the handlebar, twisting it.

4 Tighten the post bolt, be sure the handlebar is straight across the wheel.

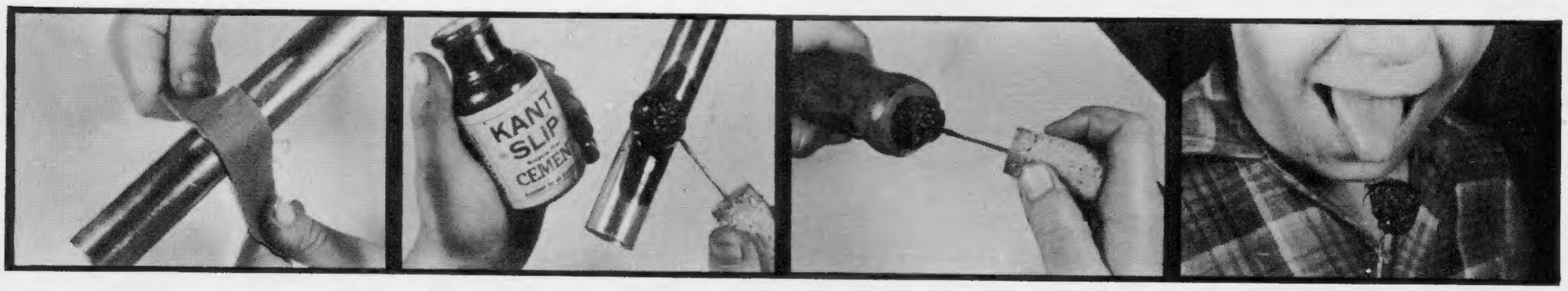
5 To tilt the handlebar, loosen the clamp bolt, tilt the bar, then tighten.

When your handlebars are right, you ride so

Ball of foot on pedal
Knee slightly bent
Body leaning slightly forward

REPLACING HANDLE GRIPS

Loose handle grips are an invitation to disaster, and bare handlebars are uncomfortable to hold. So do a decent job and use bicycle rim cement. If part of the old grip is still stuck on, slice it off with a knife. If your handlebars are the old type with short straight parts for the grips, lengthen the ends with wooden plugs (5) or the grip will break off. Plastic grips can be put on with rim cement, but the cement sets very slowly.

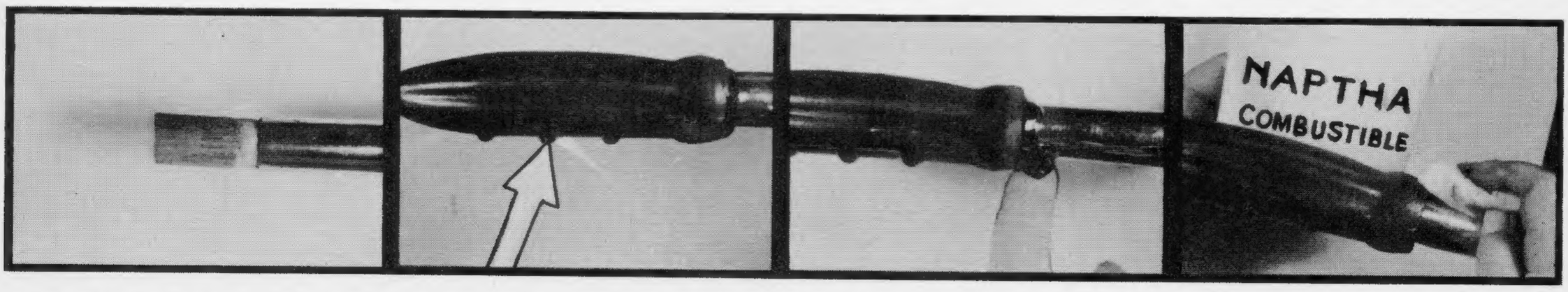


1 Clean and roughen the bar with emery cloth.

2 Apply rim cement with built-in lollipop.

3 Put cement inside the handle grip also.

4 Uh-uh! Don't lick it! Nasty!



5 If the straight end of the handlebar is shorter than the grip, add a plug.

6 Push grip on while turning it. Finger ridges go underneath.

7 Wipe excess cement off with your finger. Icky! Icky!

8 Clean up the rest and your fingers with naphtha or alcohol.

My! My!  A Flat!

BALLOONS AND LIGHTWEIGHTS

Do you suffer from flat tires, slow leaks, and bad valves? There is hope for you! But not much, unless you fix them. A sudden flat with a large tack in it—this is easy. Leave the wheel on the bike; just get one side of the tire over the rim, and pull that part of the tube out. A slow leak? Spit-test the valve; if it bubbles, tighten it. If it still bubbles, put in a new one. If it still—no, it won't! But if the valve is okay, then take off the wheel and dunk-test the tube. Wipe off the bubbles and watch for any that come back. No bubbles? Then the tube is porous; fill it with puncture seal fluid.

You can take a balloon tire off with your fingers—don't use tools to pry it off. You may pinch the tube and puncture it. Worse, you may break the wire inside the tire edge—new tire coming up! If you have trouble taking the tire off, it means too much air in the tube or you didn't unstick the tire from the rim edge. Lightweights need tire tools in coming off but go back on without.

Before replacing the tire, be sure the rim is not bent, damaged or badly rusted. Remove rust with a wire brush, and straighten the rim—see Truing a Rim.

Be sure no spokes are sticking into the tube, they will puncture it. File them off and use the rim strip. Center it to cover all spoke nipples, and line up the hole for the valve with the one in the rim.

The talc between the tire and the tube lets the tire work around the tube and rim. If the tire sticks to the tube, the valve stem may pull out.

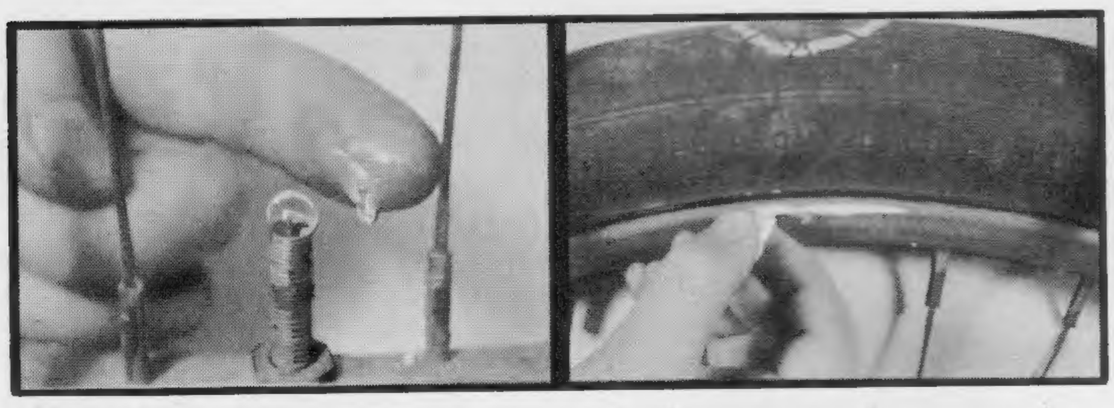
If you are putting on a new tube or casing, be sure it is the right size for the rim. The tube size is stamped on it and should match the tire size.

Bike tires need filling every week—balloons at 22 to 35 lb. depending on your weight, lightweights at 50 lb. and single tube tires at 40 lb. Do you want a deluxe tire filler? Put a tire filling nozzle on a paint sprayer and set it for 28 lb.—ours serves a large and lazy family.

Go over your tires several times a year and remove any glass chips from the tread.

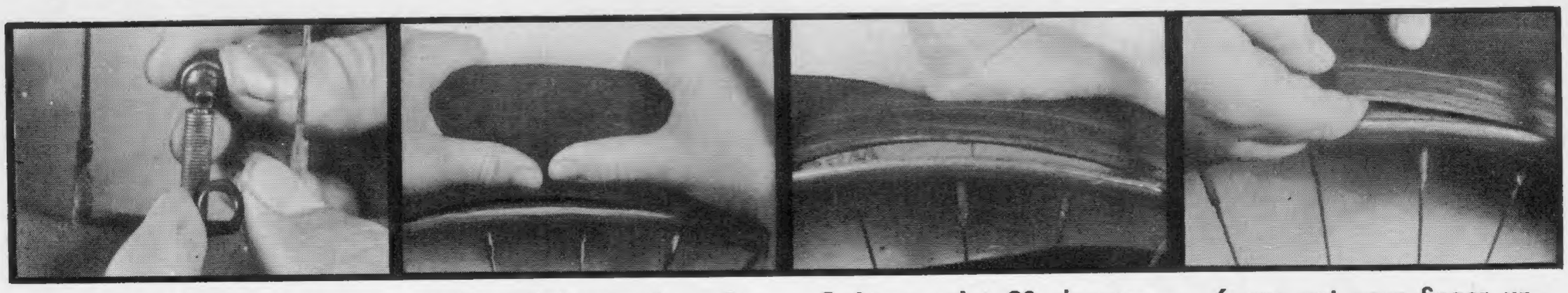
Air pressure keeps balloon tire beads on the rim step (A), the wire in the bead prevents it from going over the edge. When deflated, one side can drop into the rim well, the other side can come off (B), Lightweight tire beads press into the hollow rim edge (C) but can be pried over the edge if deflated.

Removing the Tire — Fixing a Puncture



1 Before you assume a puncture, test the valve with spit. If it bubbles, tighten or replace valve.

2 If you see the cause (a tack?) mark both tire and rim to find the hole in the tube.



3 Remove the valve stem nut, let the air out (if it isn't already out!).

4 Unstick the tire from the rim all around so it can go in the rim well.

5 At a point 90 degrees from the valve, roll a balloon tire back so you

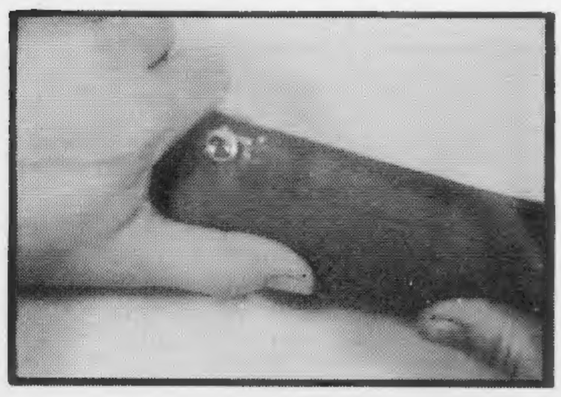
6 can get your finger under its edge and pull it over the rim.

7 Get a tire iron under the bead of the lightweight tire,

8 another one about 6 inches away, and pop the edge over the rim.

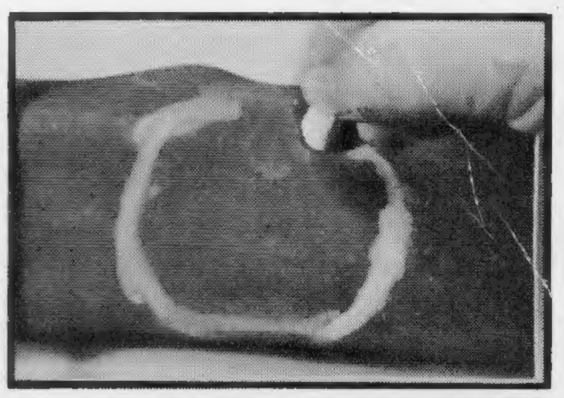
9 Repeat with one iron another 6 inches away, pull the tube out.

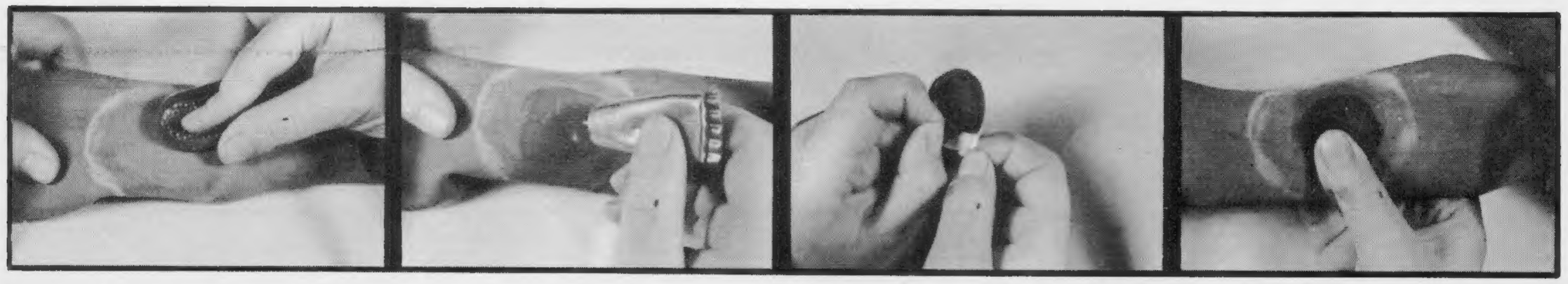
10 Pry the other lightweight bead off if removing the whole tire.



11 If you don't know the puncture location, take off the tube, blow it up and listen for hissing. No hisses? Remove the wheel. Dunk the tube in water, look for bubbles that keep growing.

12 Dry the tube, mark the place with chalk.





13 If available, clean with gasoline, clean and roughen it with the scraper.

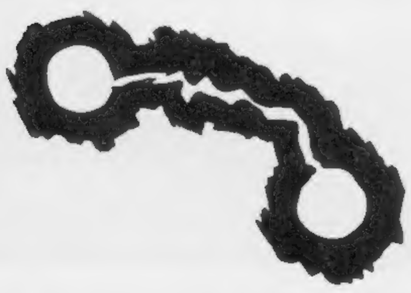
14 Smear with rubber cement, smooth it on with your finger. Let it dry.

15 Peel the linen off a patch.

16 Squeeze the patch in place.

Patching "Wartime" Tubes

Synthetic and reclaimed rubber inner tubes will be in use for some time yet, and they do suffer punctures and blowouts. The patching procedure is the same as shown here, with these differences.



1 To prevent further tearing, "buttonhole" the ends of any tears like the sketch with a conductor's punch or a leather punch. If the latter, insert a hardwood slat through the tear so the punch cuts against it.

2 Apply one coat of cement to the cleaned area.

3 Scrape off all excess cement with a knife blade; this is very important.

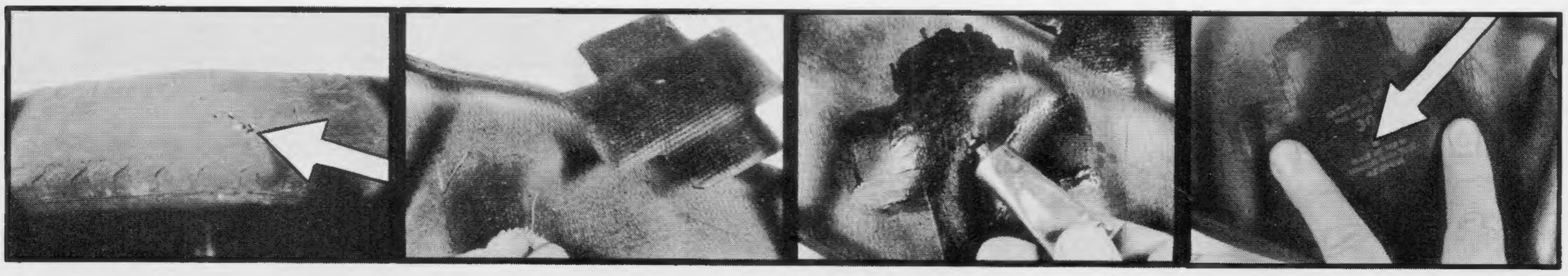
4 Allow cement to dry 15 minutes at least.

5 The patch must extend beyond the tear by half an inch on all sides. Round all corners, bevel all edges of patch.

6 Press the patch down very tight, preferably roll it from center to edge with the end of a can or other round object.

7 Allow the repaired tube to rest at least fifteen minutes before mounting and inflating.

Repairing the Tire Casing



1 Beware the Bulge! The cords inside are damaged but can be patched. You will need a new tire soon.

2 With gasoline, clean an area bigger than the patch. This type patch needs no cement on it.

3 Spread rubber cement on evenly, smooth it with your finger, let it get tacky-dry.

4 Press the patch down with this line parallel to the cords inside the tire. Talc the whole area.

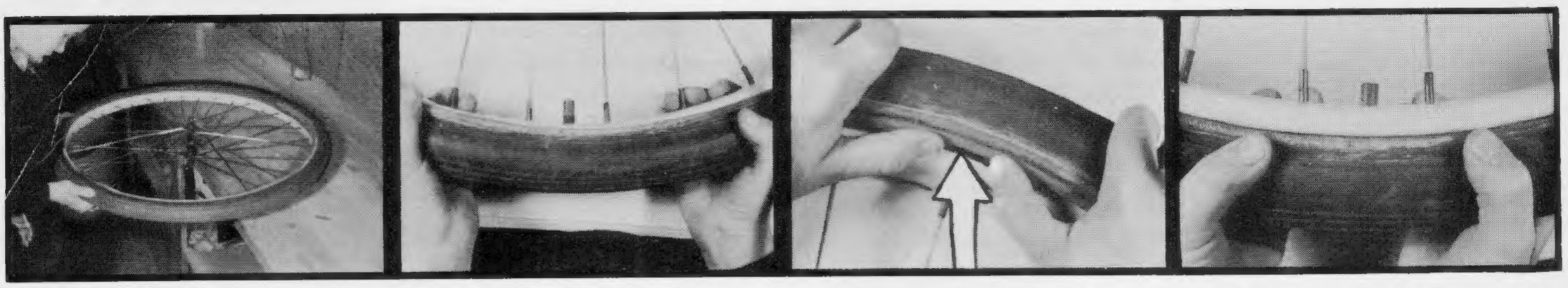
Mounting the Tire on the Rim

1 Feel for tacks, brambles, etc., all around the tire.

2 Dust the whole tire with talc—nice baby!

3 Inflate the tube enough to unwrinkle it, stuff it in.

4 Start the rim strip at the valve hole. Talc it.

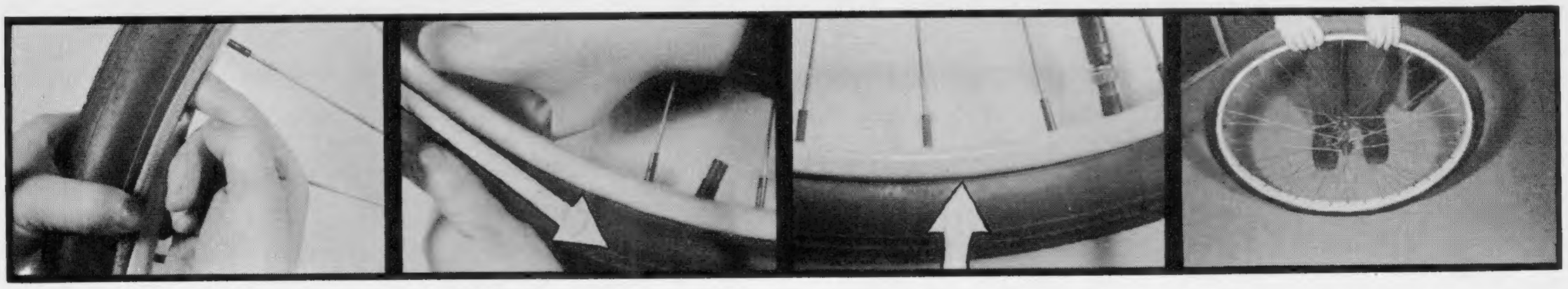


5 Hold the wheel with its hub against a bench edge, tire on top, valve near you and inserted in its hole.

6 Start the lower bead, work both ways from the valve, press down on the bead equally with each hand.

7 Some slack should accumulate ahead of your hands, but if required, pop the last bit of lower bead over the rim with your thumbs.

8 With the valve pushed in, start the upper bead. Work both ways from the valve as before.



9 If necessary, keep pushing the tube into the tire so it won't be pinched. Don't use tire irons.

10 Push the valve in, let it go, to free the tube. If the valve is crooked, hold the spokes, slide the tire to straighten it.

11 Inflate slightly (5 lb.), see if the embossed rim line is visible all around both sides.

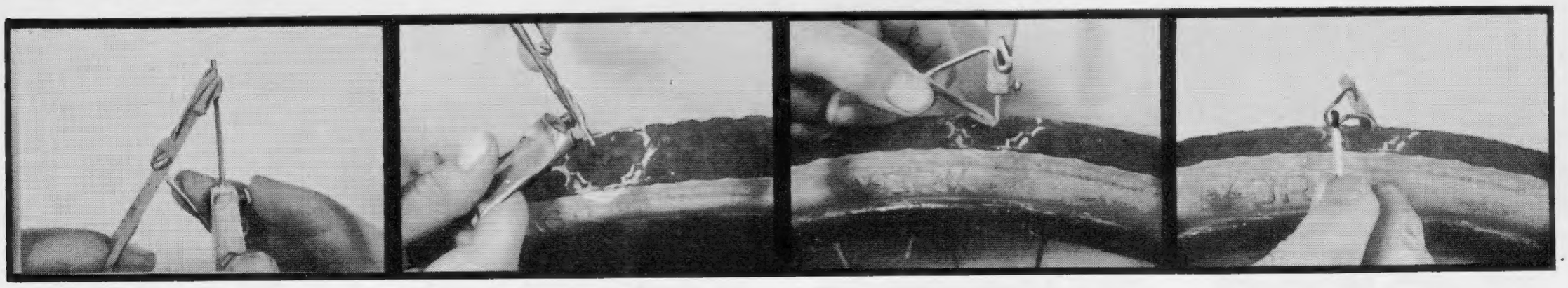
12 Bounce the wheel, turning it to free tube kinks. A bit more air, then deflate to arrange tube. Fill and put on the valve cap.

SINGLE TUBE TIRES

The Grandpop of bike tires! Swell if kept pumped to 40 lbs., but too much makes a grand pop. If run soft, the back tire comes uncemented from the rim, creeps, and pulls out the valve stem. You can get replacement valve units shown here.

Little punctures are located by hissing or dunk-test (does it bubble slowly underwater?) and fixed with rubber bands. Bigger holes can be fixed with a metal patch or a mushroom-shaped rubber plug. Slow leaks, porous tires? Squirt in a tube of puncture seal fluid.

Small Punctures



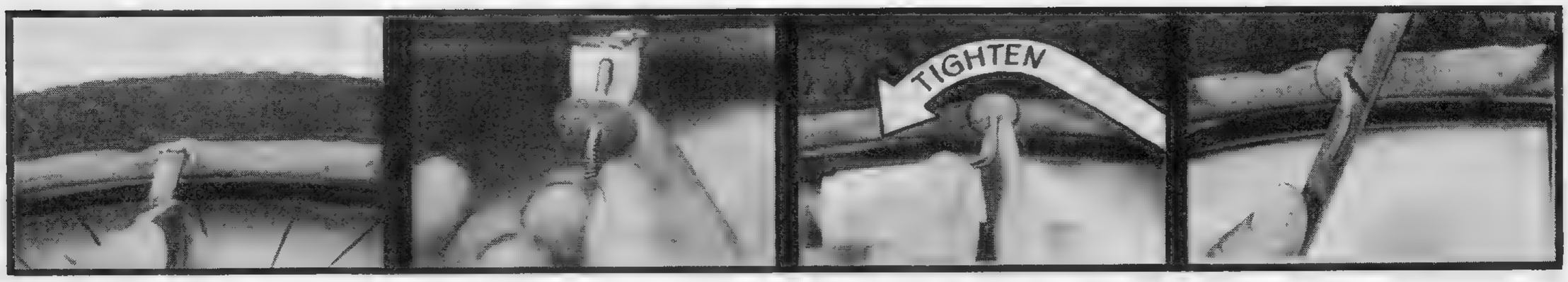
1 Stretch rubber bands on tool meant for the job.

2 Put cement on the bands, poke them into the hole.

3 Release the bands. They swell and fill the hole.

4 Burn or cut off the whiskers. OK!

Larger Ones



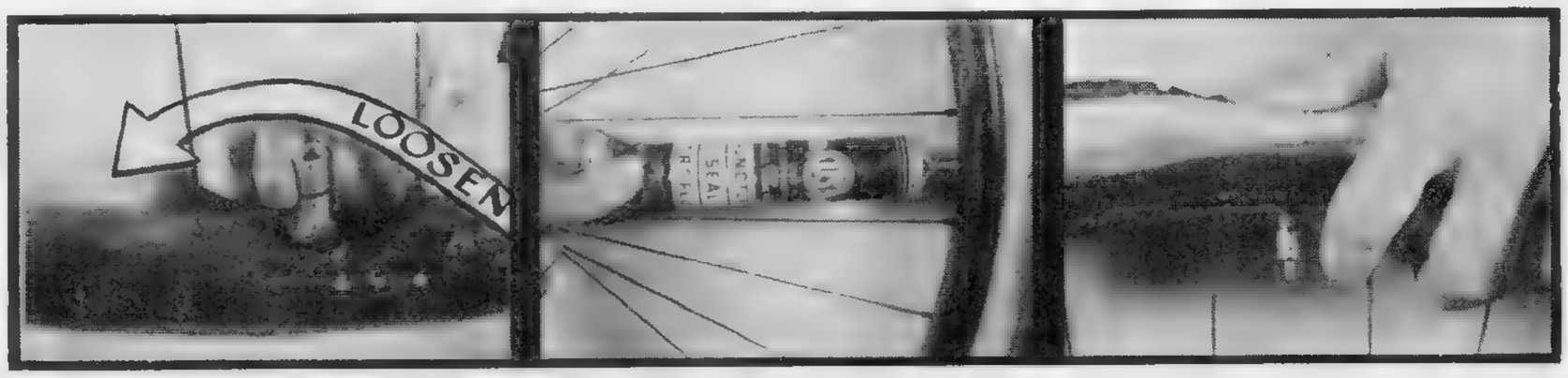
1 Sabotage! Slit the hole (along, not across the tire) just enough so

2 the patch can be pushed in after putting rim cement on it.

3 Screw down the round nut. Tighten by twisting the bent threaded part.

4 Cut or file off the end. Be sure it holds air first!

Fixing a Porous Tire



1 If dunk-testing tire and rim shows no puncture, treat for porosity. Remove the valve inside.

2 Screw the tube end into the valve stem, squeeze all the goo into the tire.

3 Valve cap on, squeeze goo all around the tire. Clean out the valve stem, replace the valve inside.

Cementing a Single-Tube Tire on the Rim

Before cementing the tire on, true up the rim. It probably needs it. Many wooden rims want to be anything but a circle. You can't replace spokes or do a good truing job after the tire is back on. If any spokes poke out (they shouldn't) file them off.

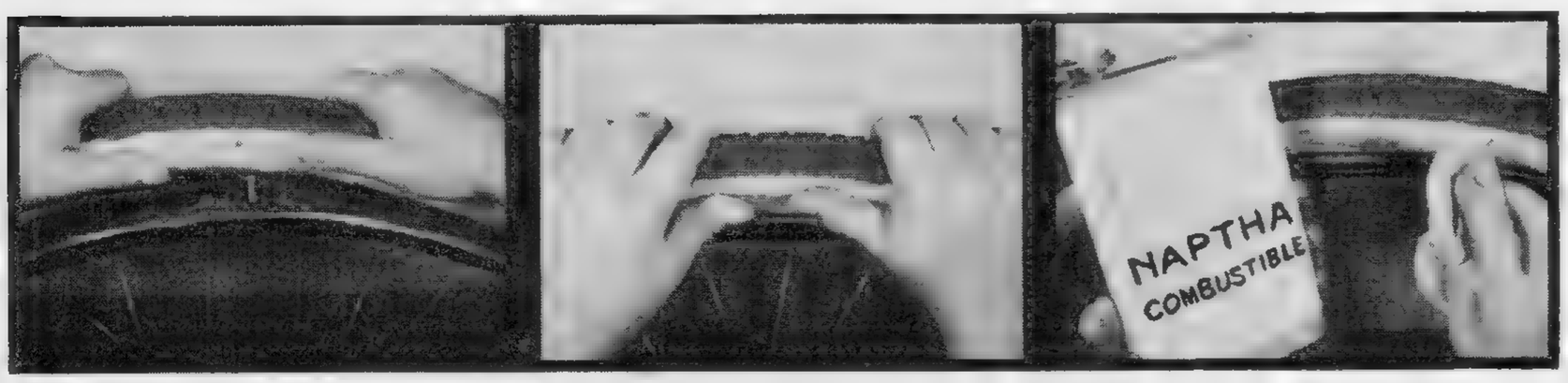
Use rim cement, not shellac—it dries out. After cementing and inflating, let the bike stand overnight or longer before you ride it. And keep pressure up to 40 lb.!

1 Scrub the rim with a clean wire brush.

2 Also the inner face of the tire unless new.

3 Spread rim cement on the tire evenly.

4 And on the rim.



5 Put the tire on, valve first. This gets messy!

6 Roll the tire to make the tread look centered when viewed from above it. Inflate to 40 lb.

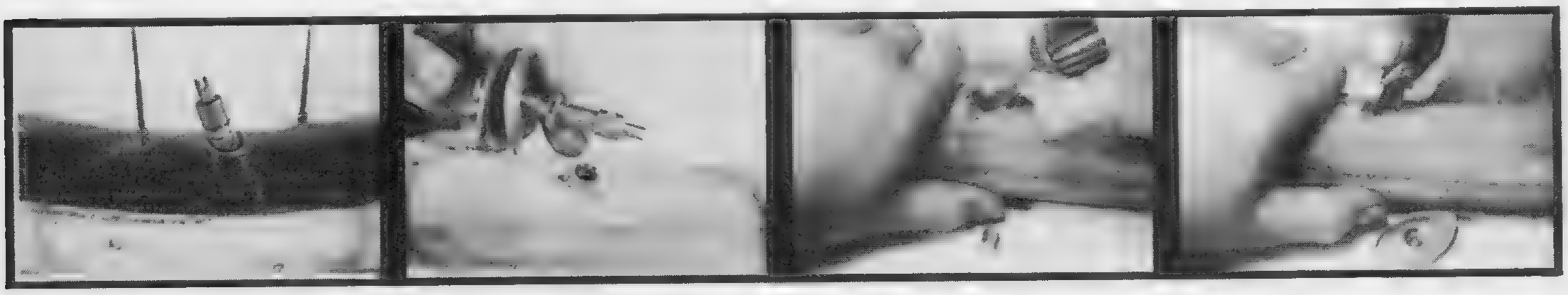
7 Clean up the tire, rim, and your hands with alcohol or naphtha.

Replacing a Pulled-Out Valve Stem

The valve stem will pull out of a single tube rear tire if the tire becomes uncemented from the rim. They also pull out of inner tubes of balloon or lightweight rear tires if the tube sticks to the tire (lack of talc). Pedaling the bike makes the back tire casing creep around the rim; it must be able to slide on the tube.

We show here an oval base repair valve applied to a single tube tire. Inner tubes can be fixed in the same way with clamp-in repair valves. Rubber base valves are also supplied. One type can be cemented, another type vulcanized to the tube. If the inner tube hole is badly torn, patch it over and put the valve in a new place.

While not shown here, some repairmen use a tire patch, larger than the oval washer, and with a hole in it for the valve stem. This is cemented to the outside of the tube and clamped under the washer. This may add strength to the job, but probably no additional air seal, as air can work around the stem threads. The real seal is made between the upper surfaces of the base and the inside of the tube.

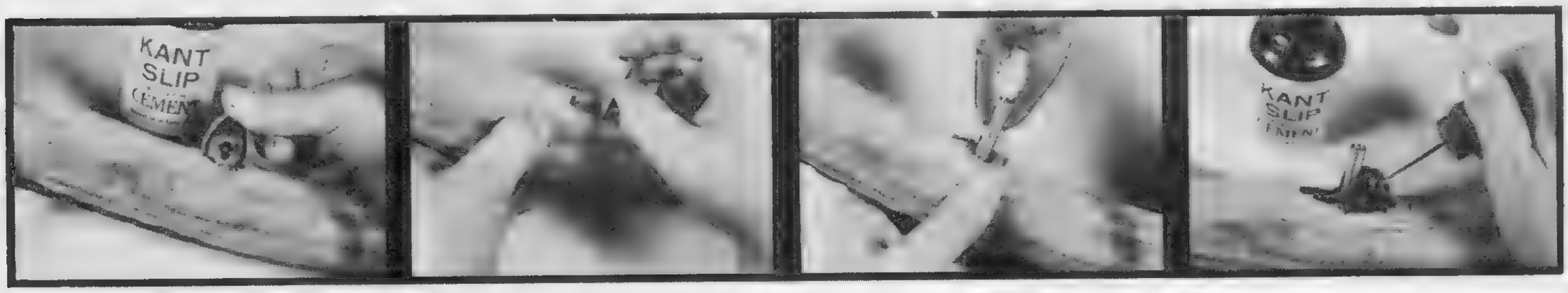


1 This valve stem is about to pull out of a single tube tire.

2 It did—and here's the repair valve you need to replace it.

3 Cut off any projecting rubber, enlarge the valve hole slightly.

4 Slit (along, not across the tire) both sides of the hole, enough to

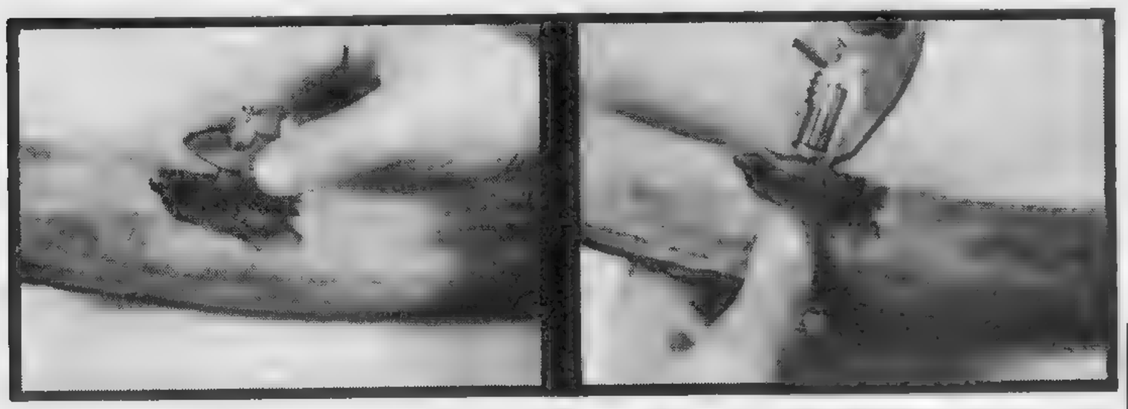


5 push in the oval base after smearing its top surface with rim cement.

6 By gravity and a nail, line up the valve base, right side up.

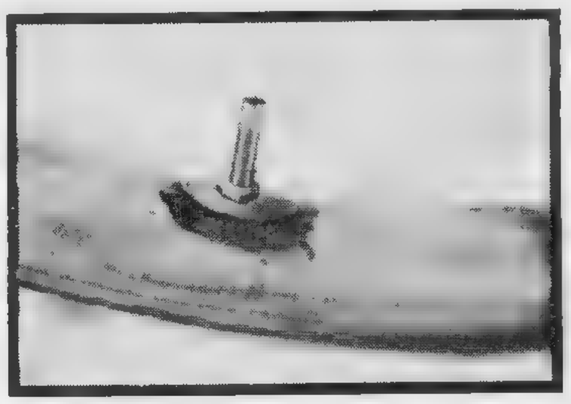
7 Hold the base through the tire, screw in the stem and tighten it.

8 Put more cement on the tire, over an area bigger than the washer.



9 Add the curved washer.

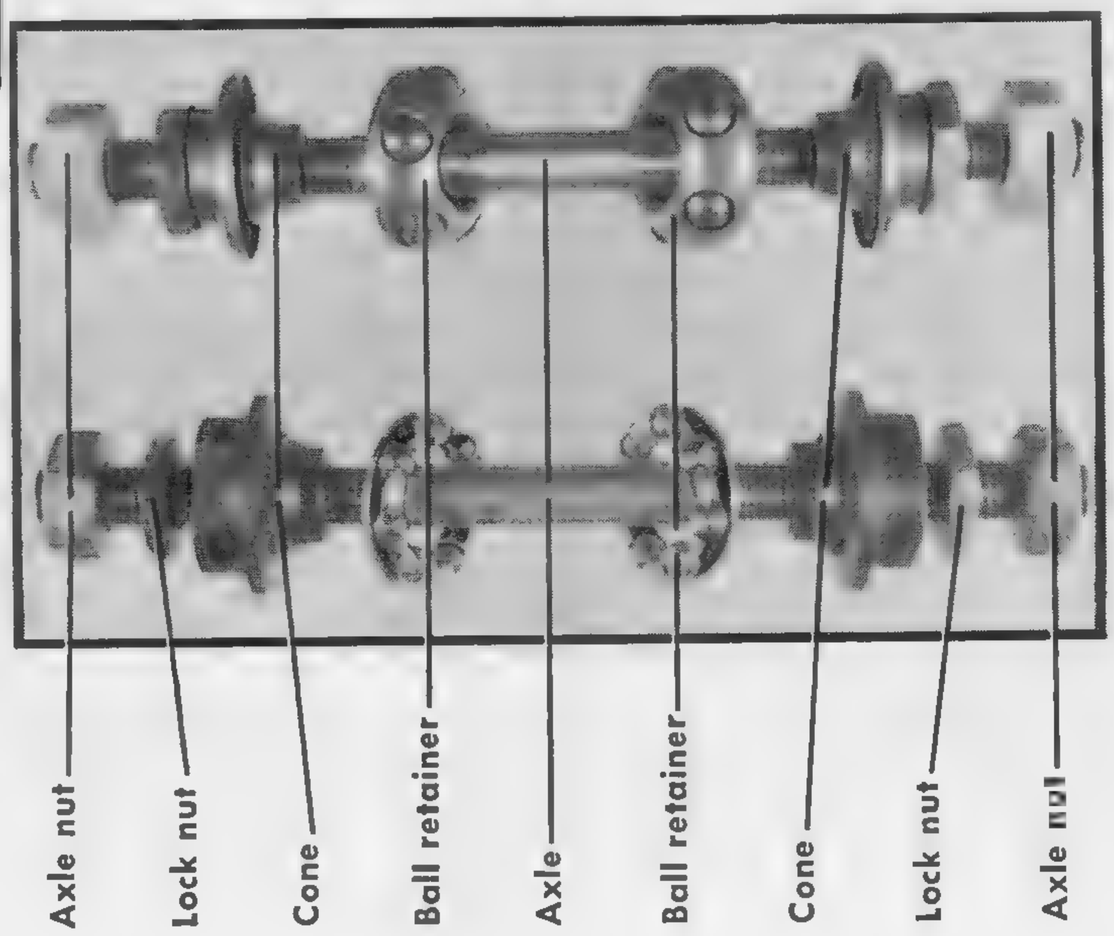
10 Add nut and tighten.



11 The finished job. Dunk-test it before recementing the tire on.

Arrangement of FRONT AXLE PARTS

Two common types are shown here. Lock nuts are not usual, but have been added to the lower axle. Washers, when present, are inside the axle nuts and usually outside the fork. The commonest mistake in putting axle parts back together is getting the ball retainers on backwards.



Front Wheel

Your front wheel doesn't interest you unless (a) the tire goes flat; (b) the tire rubs the fork; (c) an axle nut loosens. If tire trouble demands removing the wheel, just follow the pictures. If the wheel rubs the fork, loosen one nut, adjust the cone (12, 13), center the wheel in the fork, and tighten the nut. If the first nut doesn't do the trick, use the other one the same way. If the wheel is so warped that no axle position prevents the tire from rubbing the fork, see p. 31. For a loose axle nut, adjust the cone and tighten. Adjusting the cone to get the bearing clearance right is most important. Keep adjusting the cone and trying the wheel after tightening the axle nut, till the clearance is right (See 14).

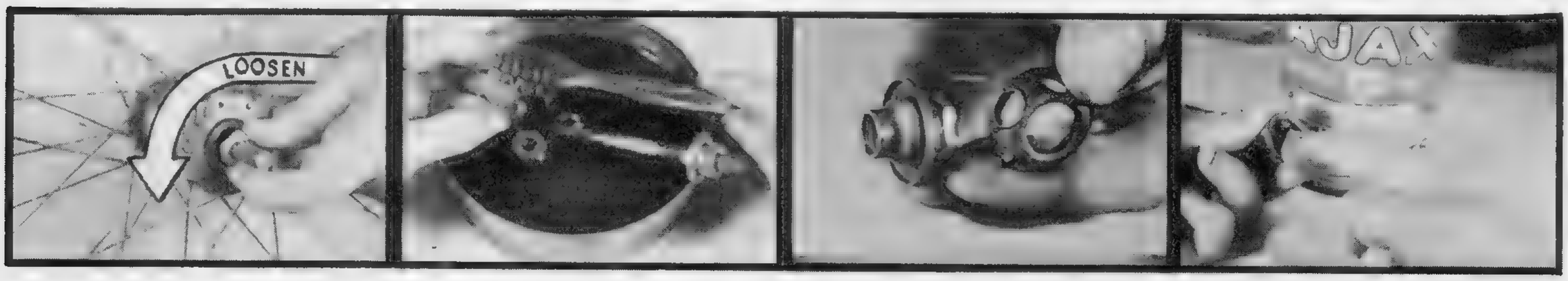
One frequent trouble in taking off a wheel is caused by battered axle threads. Perhaps the first nut comes off easily, but turning the second merely turns the axle. If so, put back the first, tighten it to hold the axle and remove the second. Do likewise to unscrew a cone over a bad thread. NEVER hold the threaded axle by a pliers.

Lock nuts are not usual on most front axles, but if you have lock nuts, adjust the bearing clearance in a vise, as shown for the coaster brakes and omit steps 12, 13. In any case, test bearing clearance as in 14, if there is too much clearance, loosen the nut, tighten the cone 1/16 turn, and tighten the nut again. Keep at it till it's right.

Forks with slotted ends are more usual than the one shown here, and the wheel drops right out without prying.

1 Turn the bike upside down. Remove both axle nuts.

2 Spring the fork off the axle with a slat and screw driver.

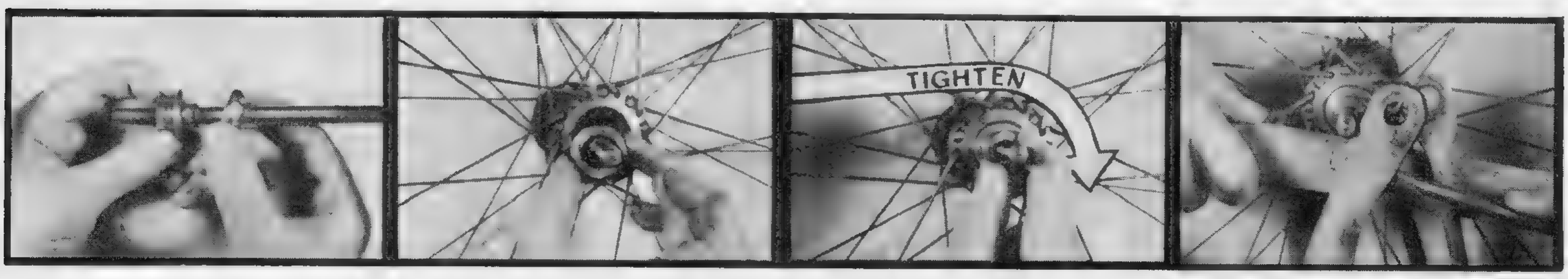


3 Unscrew one cone, use wrenches on both cones if needed.

4 Take out axle, ball retainers, scrub parts and hub in kerosene.

5 Rough cone surface and worn ball retainer. Get new ones!

6 Grease both ball retainers with ball-bearing lubricant.

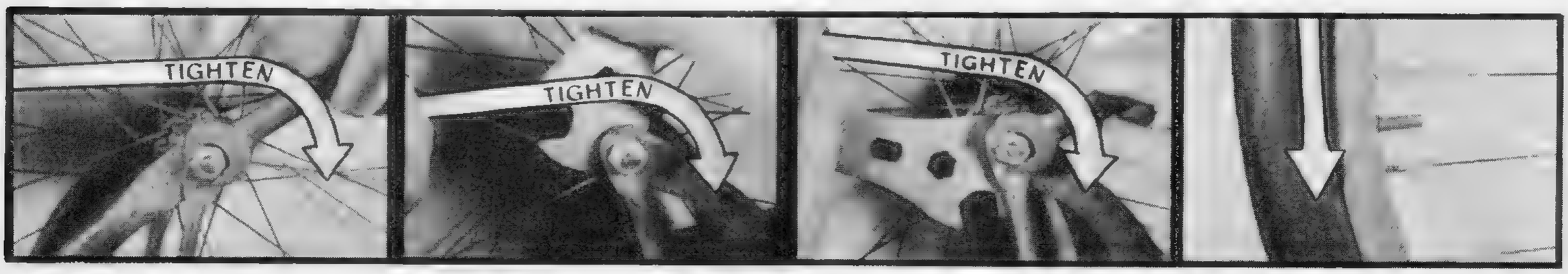


7 Screw one cone on 3/4", add ball retainer flat side toward cone.

8 Put axle through hub, add second ball retainer flat side out.

9 Add other cone, tighten against ball retainer with fingers.

10 Spring the fork back on the axle the same way as before.



11 Tighten one axle nut to hold the axle for bearing adjustment.

12 Start the other nut, tighten the cone lightly against ball retainer.

13 Loosen cone 1/4 turn, center the wheel in the fork, tighten axle nut.

14 The wheel should turn by valve stem weight, but not rattle on the axle.

Front Fork

Your front fork does not go wrong unless you smack into something, or leave the bike on the driveway behind a car. Then, among other things, the fork gets bent and the bike won't steer well.

While fork bearings don't wear from continuous turning like wheel bearings do, they need cleaning and greasing on the annual overhaul.

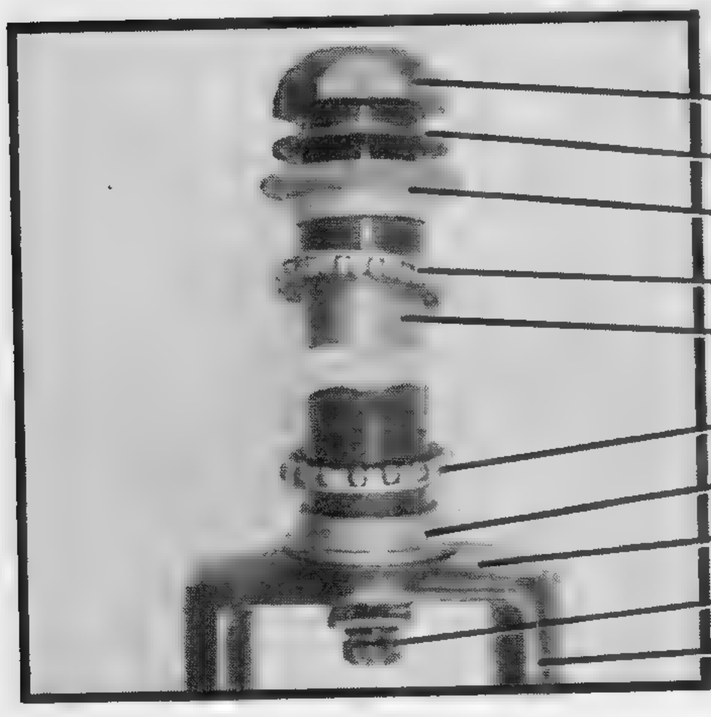
To take the fork off, remove the handlebar post, front wheel and fender in that order. Then the procedure is quite similar to taking a pedal apart after its rubber treads are off. Unscrew the nut (shown in 3), lift out the key washer, unscrew the cone, drop the fork out, remove upper and lower ball retainers. Clean everything in kerosene, fill the retainers with ball-bearing lubricant. Put it back together in the same order, be sure the flat sides of the retainers face the cones. Adjust the bearing clearance before adding wheel or handlebars. Do it this way:

1 Add the cone, tighten it against the ball retainer with your fingers, then unscrew it 1/4 turn.

2 Add the key washer, its lug in the keyway. This washer prevents the nut from turning the cone.

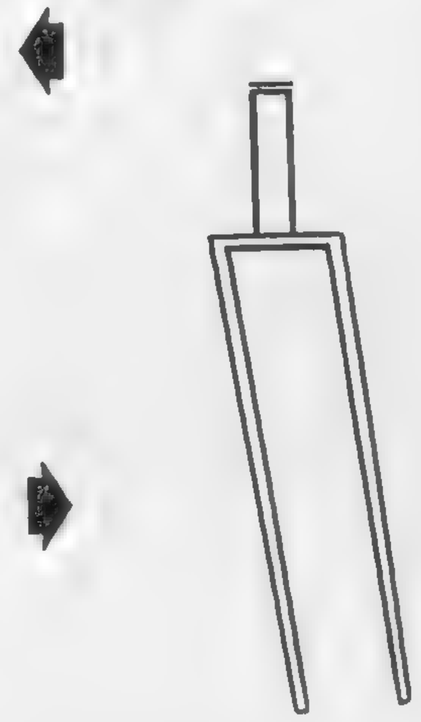
3 Tighten the nut. This moves the cone downward slightly so the nut must be tight when you test the bearing clearance.

4 Try turning the fork. It should rotate freely, but not click when pushed up. If wrong, loosen the nut, tighten the cone 1/16 turn, tighten the nut. Try it again.



While it is out, check the condition of the fork. If it has suffered a head-on collision, it is probably bent like this.

Other accidents can do this.



STRAIGHTENING A BENT FORK (and main frame too) is usually a job for the experts. You need a heavy vise with coppered jaws. Grip the stem, with the handlebar post in it so it won't squash out-of-round. Then hold the fork prongs, put your foot against the bench and pull like—, well, pull hard. Get the stem in line with the upper part of the prongs. Are the prongs parallel to each other? When laid on a flat bench both ends should rest on it when the whole shoulder touches the bench edge. More bending needed!

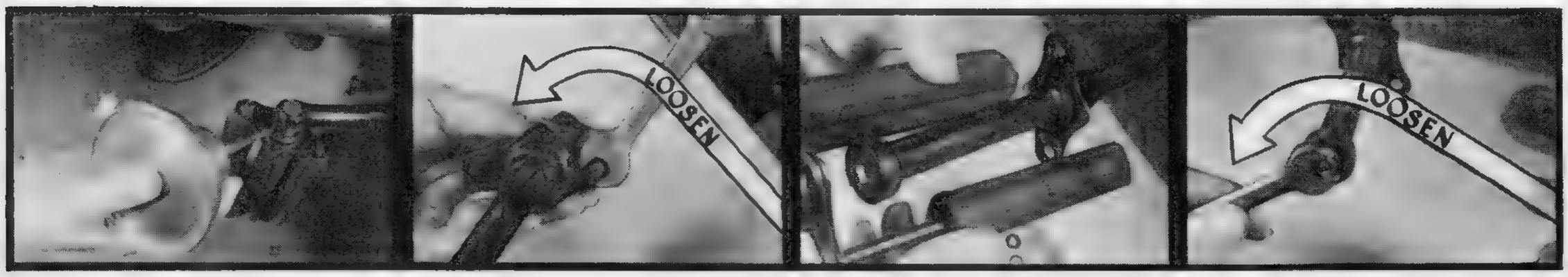
IF YOU BUY A NEW FORK, take in the old one or specify the size and type of wheel and the length of fork from shoulder to top. The tube of the stock fork you will get will be longer. Saw it off squarely to match the old one in length, or assemble it into the bike, leaving off the nut and mark the tube 3/8 inch above the key washer. Then take it out and saw it. The cones, bearings, washer and nut you have will fit.

REMOVING A BROKEN HANDLEBAR POST

If the handlebar post seems wobbly or won't stay tight, it is probably broken across the top of the slot. Take the post bolt out, then the post. If the post bolt loosens but won't come out, the broken post parts may jam the taper plug, so the post will be hard to pull out. If so, turn the bike over; the post will come out easier. Then remove one handlegrip, loosen the clamp bolt and take out the handlebar. Get a new post and put it in.

Pedals

If you are mechanically innocent, make your first victim a pedal—dissect it. If you kill it, replacement is cheap. What you learn about adjusting bearings applies to all others on the bike. Just follow the pictures. Pedals rarely go wrong if they are screwed on tight and if you oil them a few times a season. Neglect kills the bearings and finally the whole pedal. If the treads split, replace them, see 2, 3, 16. If a right pedal runs loose or a left one tight, the lock nut is loose and the cone needs adjustment, see 13—15. In some pedals the cone is riveted on the spindle, so if the bearings go, get a new pedal. Specify whether right or left, and tread length.



1 With the bike on its side, squirt in 30 SAE oil from the crank end.

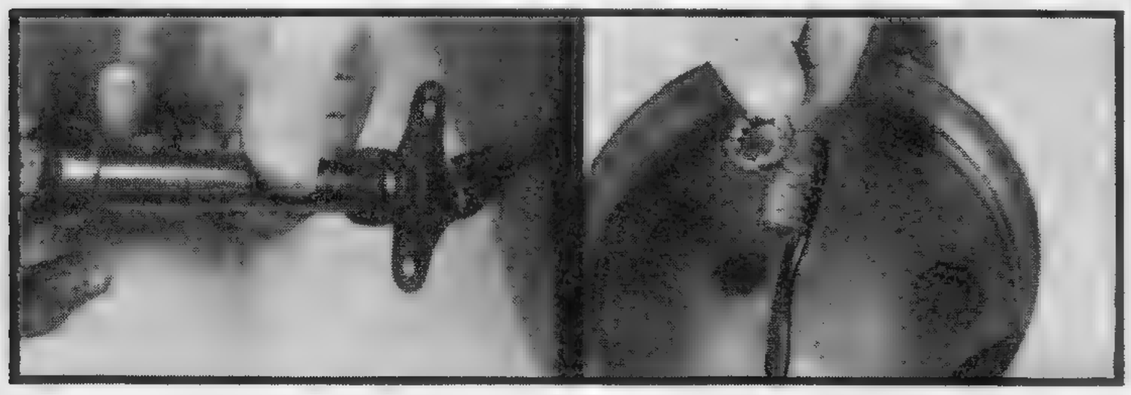
2 To take a pedal apart, first remove the nuts holding the treads.

3 Pull off outer frame and treads. Put all small parts in a can.

4 Unscrew the lock nut from the spindle—quite simple, isn't it!

5 Remove the key washer, which prevents the nut from turning the cone.

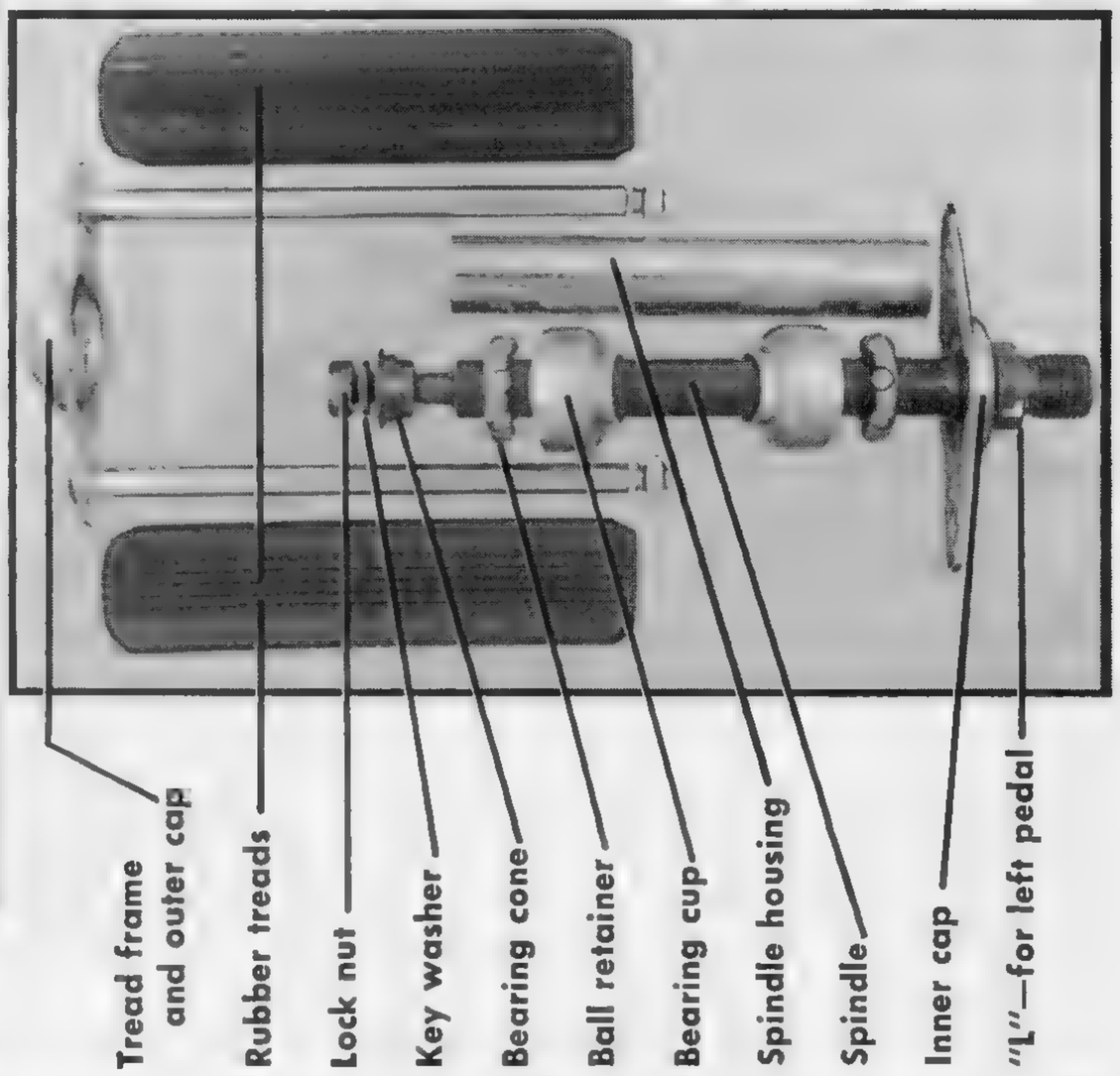
6 Unscrew the bearing cone, use a pliers if it's a tight fit.

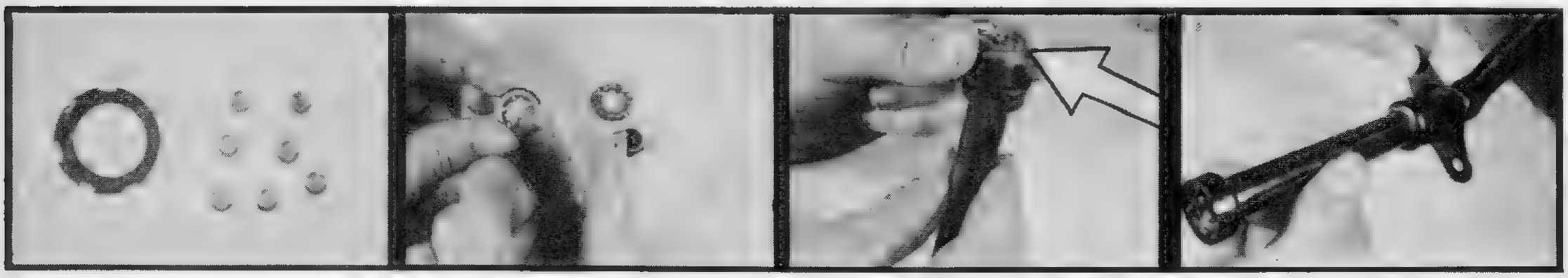


7 Pick out the ball retainer, pull off the housing and second retainer.

8 Soak and scrub everything in kerosene—Oh-oh! Whose toothbrush?

Exploded View of Pedal





9 Blot the parts dry. Replace any worn ball retainer like this one.

10 Fill ball retainers with ball-bearing lubricant or vaseline.

11 Put a retainer FLAT SIDE OUT in each end of the spindle housing.

12 Replace the spindle housing on the spindle. Duck soup, but sticky!

13 Tighten the cone against the ball retainer, then loosen it ¼ turn. This is important.

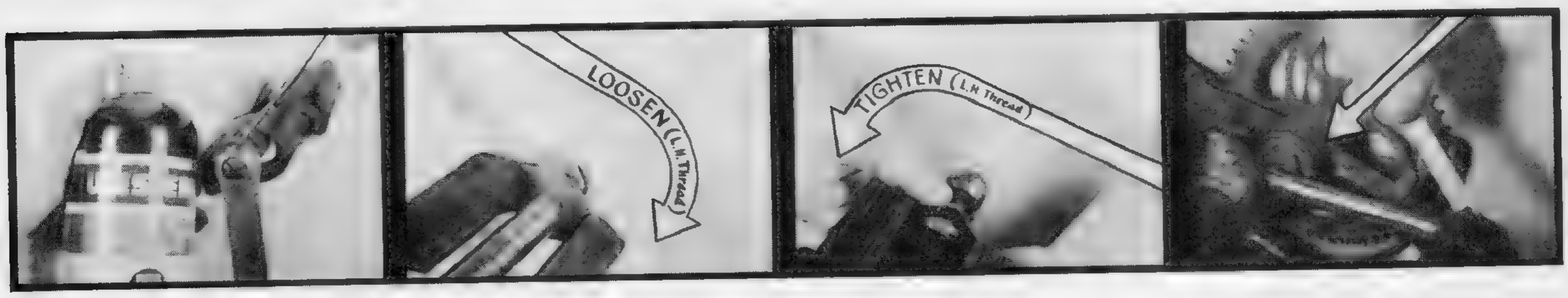
14 You are now adjusting the bearing clearance. Without turning the cone, add the key washer.

15 Tighten the lock nut. The housing must turn freely. If not, loosen the cone 1/16 turn.

16 Add the tread frame. Outer cap must go over bearing cup (arrow). Add and tighten frame nuts.

REMOVING A PEDAL

The left-hand pedal has a left-hand thread, the right one a right-hand thread. (Just opposite to what seems right.) You need a thin, long, open end 9/16" wrench to get them off. Auto supply stores sell them for adjusting tappets or something. You may also need penetrating oil for unsticking a pedal thread rusted into the crank. The opposite is also bad—a pedal that is loose in the crank—the thread may be so battered that the pedal can't be tightened on. If so, you can hold it on by a pedal coupling sold by bike dealers, see 5. Now let's take off a dead pedal, killed by lack of oil.



1 If the thread is stuck with rust, apply a penetrating oil. Let it soak.

2 Loosen a left-hand (left foot!) pedal this way.

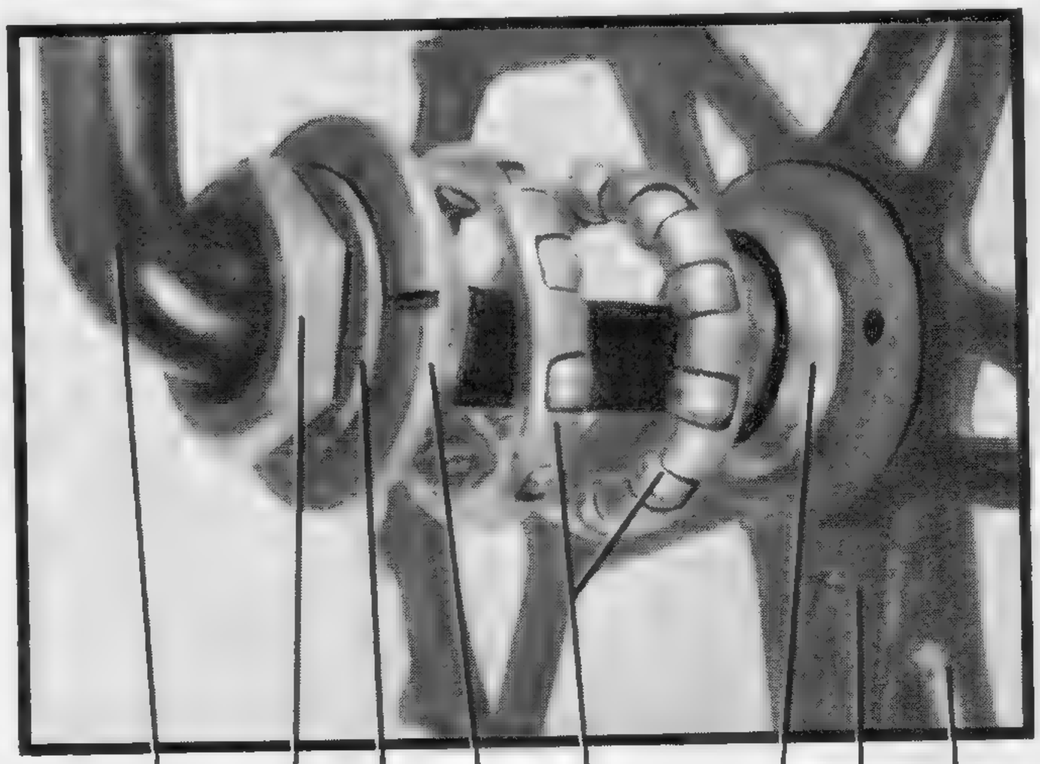
3 And start a left pedal on this way. ("L" is stamped near the thread.)

4 Tighten hard—push or pull the wrench in line with the sprocket center.

5 Stripped crank thread? Use a pedal coupling (right or left hand?)

6 If Shorty can't quite reach the pedals, attach blocks sold for the job.

Arrangement of Bearing Parts on Crank Shaft



Pedal Crank

Nobody loves a crank, but you do go around with this one, and give it a beating, too. The strain is terrific, so be nice to it. After a few years' neglect, a crank tends to run loose. If the nut loosens, the cone turns inward and the crank runs tight—then the bearings smash. If the bearing clearance only needs adjustment, see 13—16. But the chances are that the whole thing needs cleaning and greasing. In any case, grease it yearly.

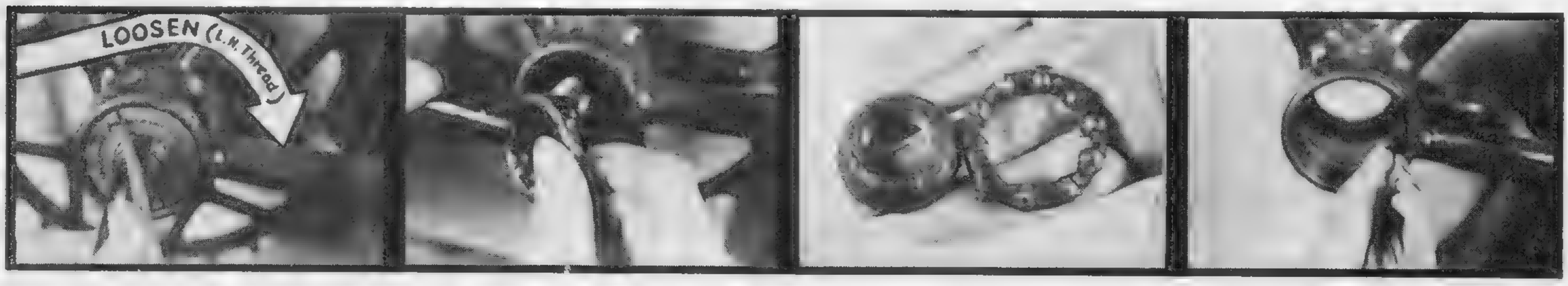
If you want to change or replace sprockets, or renew the cone next to the sprocket, a spanner wrench is needed to fit this cone. So it's a job for your bike repairman, or you may be able to manage by gripping the edge of the cone in a vise and turning the crank.

If you have to replace a broken crank, specify length from crank center to pedal spindle center, usually 6-1/2 or 7 inches.

Now, for your annual crank overhaul, first remove the chain, then—

1 Remove the left pedal, then the crank nut. Both have left-hand threads!

2 Remove the key washer. Put all these parts in a can, or you'll lose them!

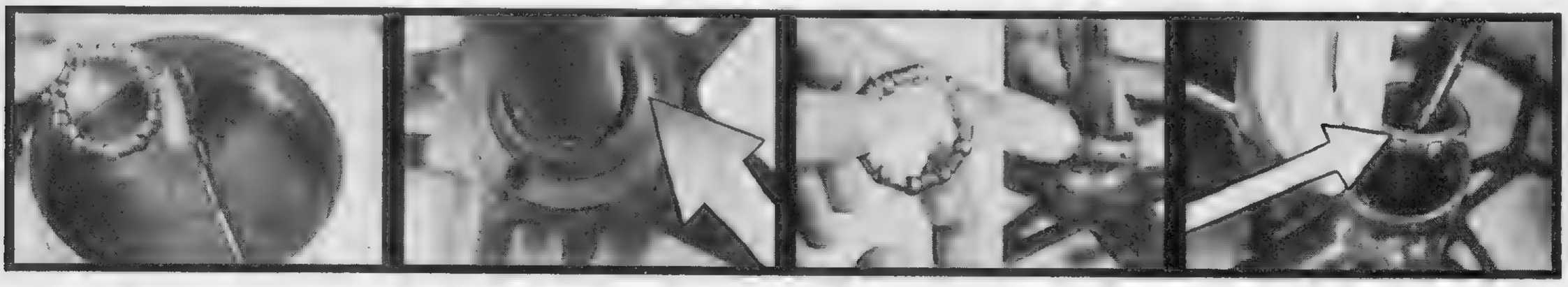


3 Unscrew the bearing cone. Watch that left-hand thread!

4 Take out the ball retainer, and pull out the crank.

5 Several years' neglect makes cones and retainers look like this. Tsk, Tsk!

6 Clean these bearing surfaces with a kerosene-soaked rag. Spotless now!

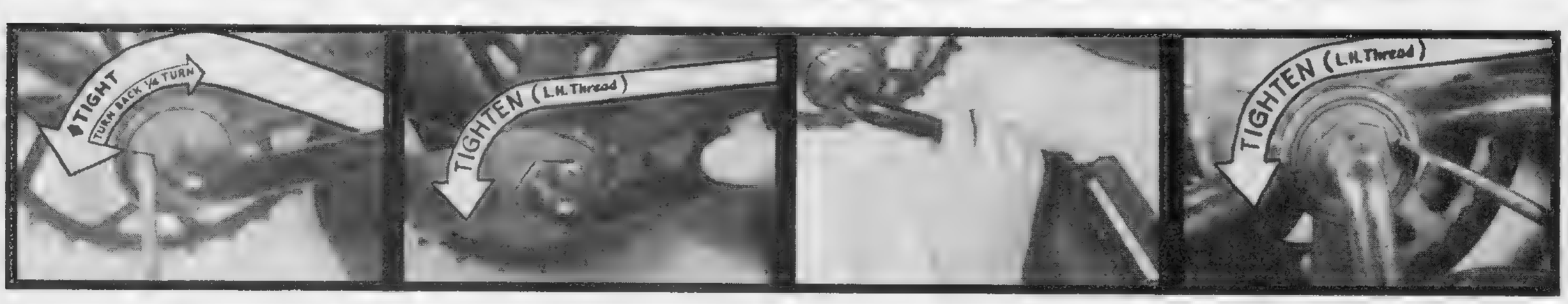


7 Soak and scrub everything in kerosene. Look like teeth, don't they?

8 Now check the clean parts for wear. Replace rough or grooved cones.

9 Apply b. b. lubricant or vaseline. Place retainer flat side toward the cone.

10 Enter crank in hanger from right side, add ball retainer, flat side out.

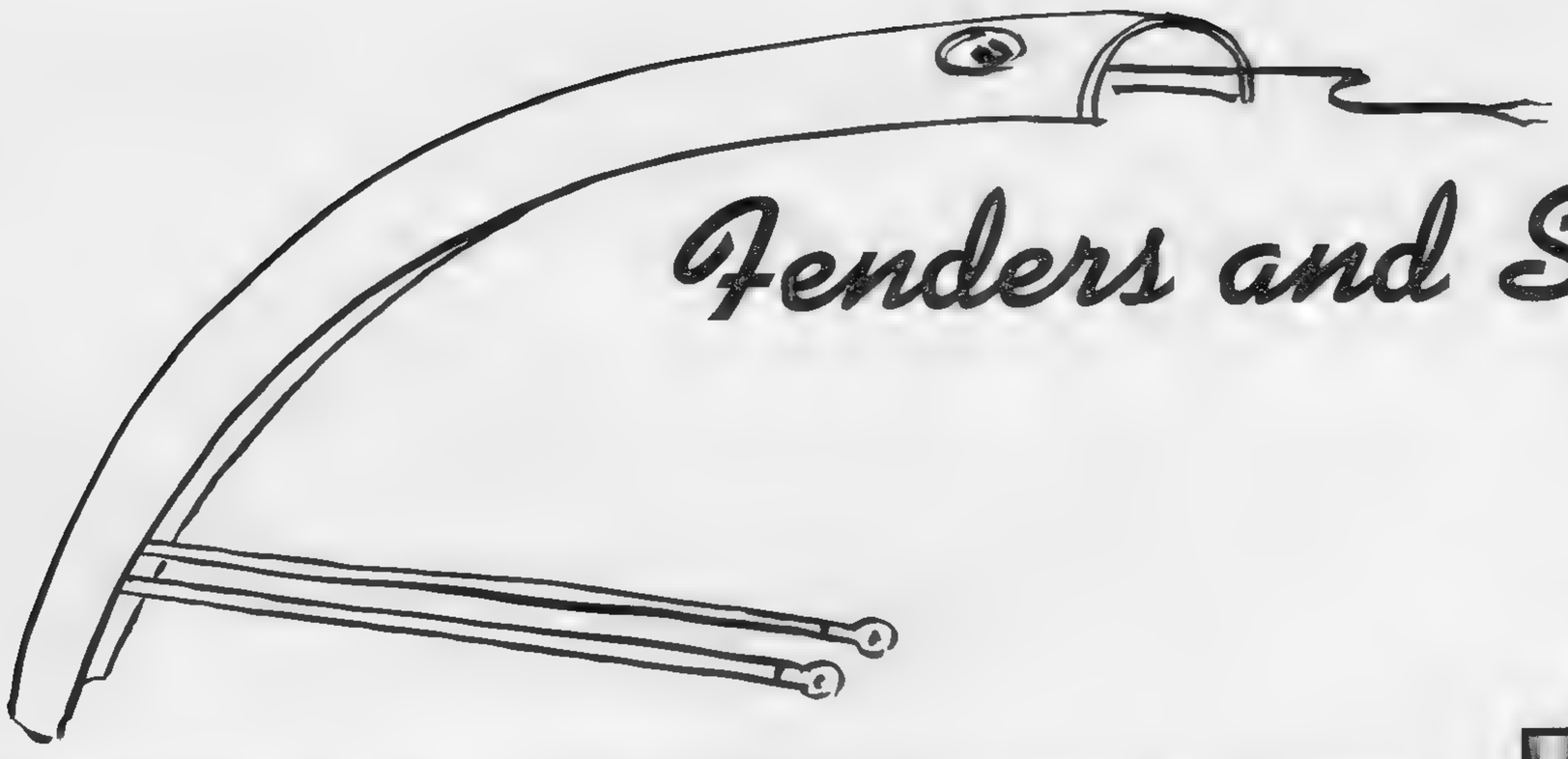


11 Now you are going to adjust the bearing clearance. These steps are most important. Screw on the cone, turning it in the direction of the big arrow (left-hand thread). Tighten it against the balls, then loosen it 1/4 turn.

12 Without letting the cone turn, add the key washer, with its lug in the crankshaft keyway. This washer prevents the nut from turning the cone. Now add the nut and tighten it while holding the crank.

13 Put the pedal on. Does the crank turn freely? It should barely click if pushed endways in the bearing. If too loose, loosen the nut, tighten the cone 1/16 turn, tighten the nut and try it again. Keep on till you get it right.

14 Another type of cone adjustment. Behind the key washer, a second washer engages the cone and turns with it. The slotted edge of this washer is shown engaged by a screwdriver. To adjust the cone, loosen the nut and follow 11—13.



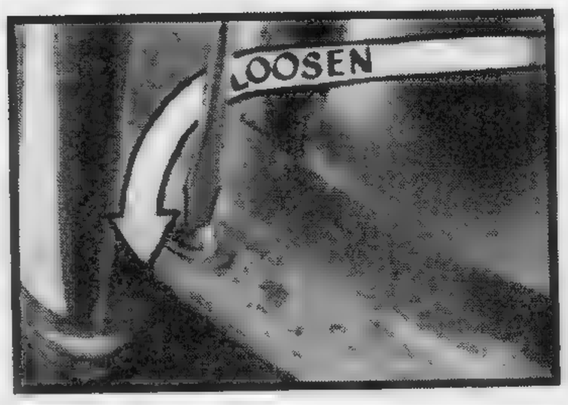
Fenders and Stays

When you were very young, you loved a rattle—do you still? If not, fix it, probably a fender is guilty. Nuts loosen up, so do rivets after enough abuse. The dandiest rattle of all happens when some alley mechanic uses the wrong bolt to hold the front fender to the fork shoulder, see 8.

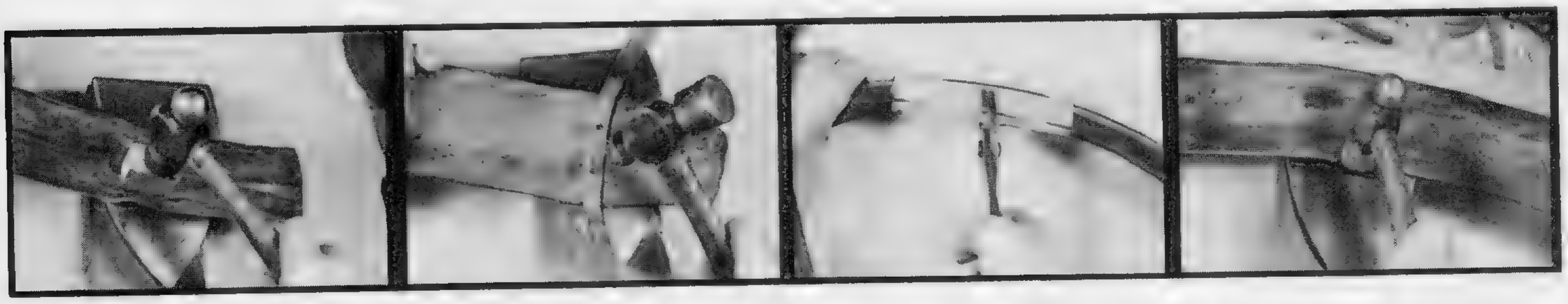
To cure that battle-scarred look, take out the dents. Use an anvil, or improvise one from an old iron, like we did.

In replacing broken stays, get the right kind, see 6. You may have trouble getting the old nuts and bolts off; if so, use a penetrating oil to cut the rust. It also helps to cut a deeper screwdriver slot in the bolt head with a hacksaw. To remove rivets, drill them out from the under side. Attach fenders to stays with rivets, or steel bolts and brass nuts.

Don't forget to adjust the bearing cones when you replace the wheel.



1 The front fender is usually held to the fork shoulder by a machine screw. Just unscrew it, after the wheel is off.

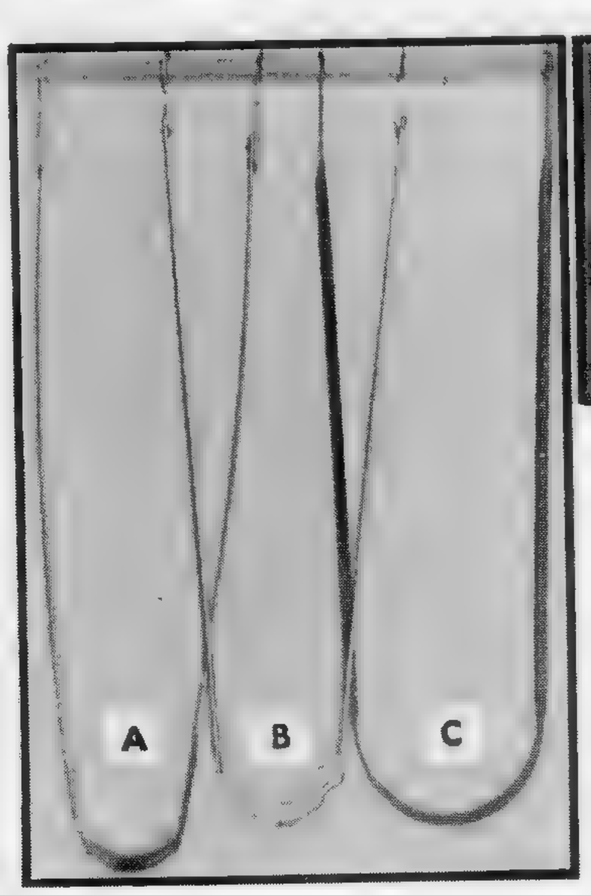


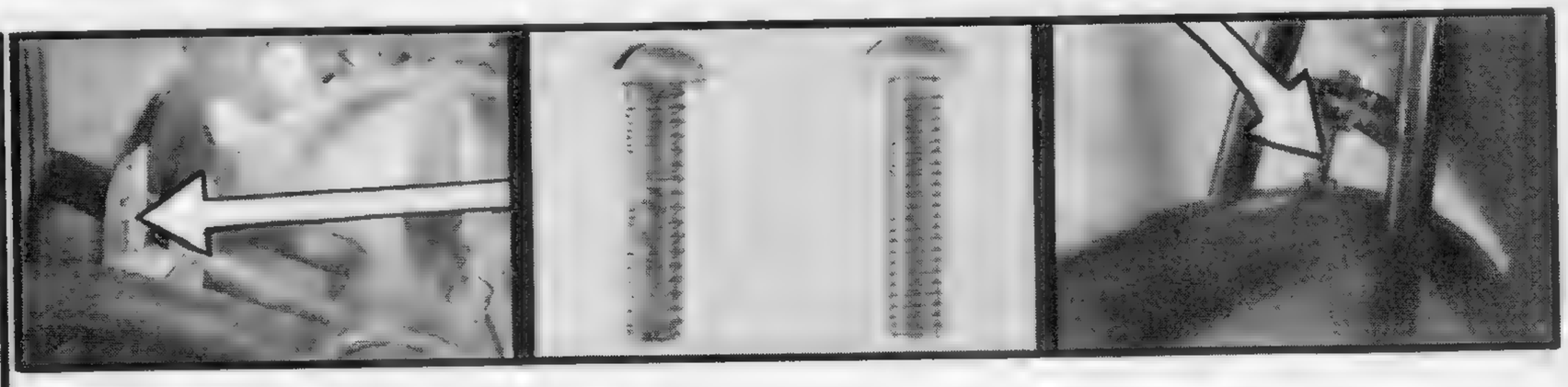
2 Take dents out of the crown with a hardwood block the width of the crown and hammer away! See the anvil?

3 To get rid of rivet rattles, do a little riveting with the ball of the hammer. Replace bad rivets with bolts.

4 Straighten a bend in the fender gripping it between hardwood slats held in a pliers. Bare pliers leave dents.

5 Take out sharp dents in the fender edge with the hammer. Treat a dented chain guard the same way. Anvil chorus!





7 When you put a rear fender on, attach it to the upper fork first, then attach this slot to the lower fork. Then tighten the axle nuts.

8 When you put on a front fender, use a bolt with the right thread, often a 10/32 (right). A stove bolt (left) will start to go in, then jam.

9 If you are fitting an old bike frame, meant for 28-inch tires, with 26-inch lightweights, the fenders look queer, out from the tire. You can use lightweight fenders, mounting them this way. Use a long threaded bolt or rod, with nuts to space it.

6 Use the right fender stay, or the bike looks queer, A—28-inch single tube, B—26-inch lightweight, C—26-inch balloon.

Easy Pedaling or Fast Riding?

If your saddle is your height,
And tires are full inflated,
Your wheel cones aren't too tight,
And chain is lubricated,
Your bike will glide all right
And Corn this will be rated!
(Translated by Machinery from Russian)

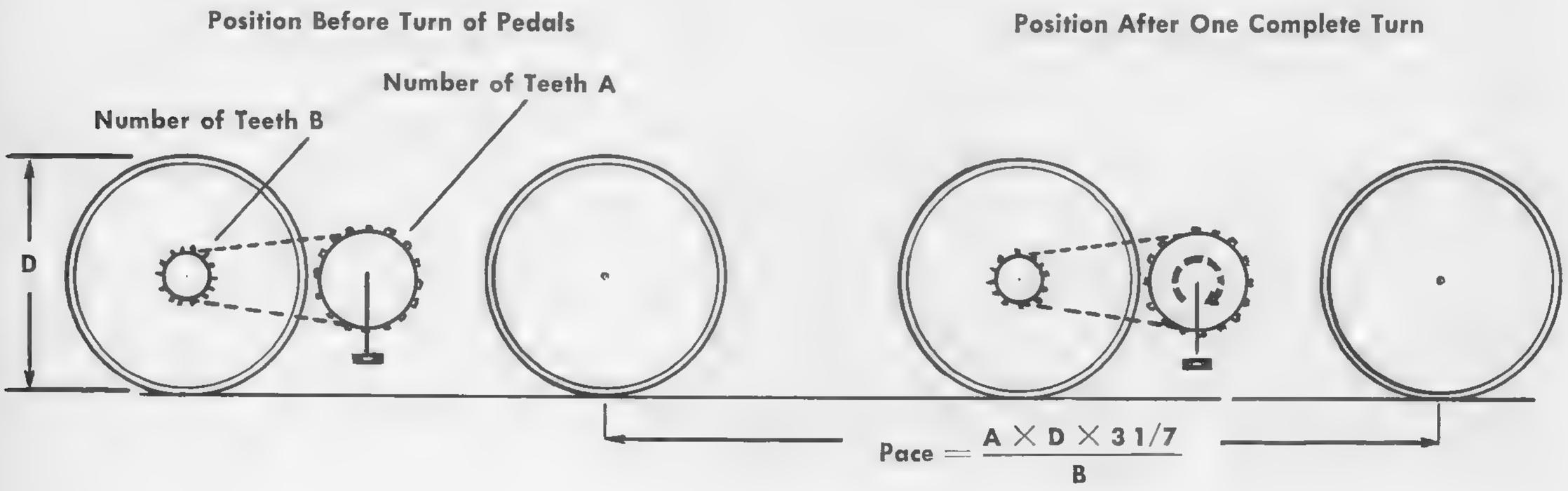
Well, that is most of it, but it also matters if the bike is your size or not. When the saddle is right for height (your heel rests on the pedal with your leg straight), you can, while seated, just reach the ground with your toe. Another thing—lightweight tires make pedaling a bit easier than balloons do (but you get spanked on rough roads). But—any bike in adjustment will pedal easily OR ride fast.

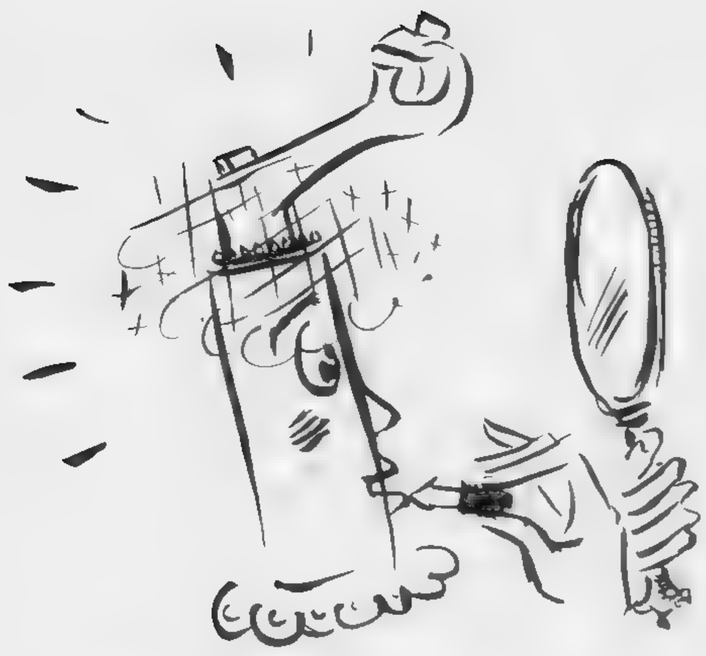
You can have your choice of one, but not both, unless you have a two- or three-speed rear hub. But you can make a change in rear sprocket in the interest of easier pedaling OR more speed. For easier pedaling, change your rear sprocket for one with more teeth; for more speed, less teeth. Nine- and ten-tooth sprockets are common sizes (18- and 20-tooth for half-inch chains)—be sure to say for which coaster brake. It is difficult to remove the sprocket from the driving screw of the coaster brake without a special tool; bike repairmen are equipped to do this work. When you increase rear sprocket size, you must add a link to the chain.

The best arrangement for a rider who doesn't bang his bike around is a three-speed hub or a two-speed conversion which replaces the sprocket and driving screw of the popular coaster brakes.

Speed and pedaling ease also depend on the front sprocket size and on the wheel size. Boys' bikes usually have a 26-tooth front sprocket, girls' bikes a 22-tooth one. The so-called "gear" of a bicycle is a figure which increases with speed; it is wheel diameter multiplied by front sprocket size divided by rear sprocket size. Multiply this by 3 1/7 to get the "pace" or distance you go for one complete turn of the pedals.

A typical boys' bike with a 26-inch tire, 26-tooth front sprocket and 10-tooth rear sprocket has a pace of 26x26x3 1/7 divided by 10 = 213 inches along the road for one complete turn of the pedals.





Repainting

You can make that sorry-looking wreck really glitter—it is unbelievable how a junker can shine. A deluxe job calls for taking the bike completely apart—wheels, fenders, fork, handlebars, crank—everything off. Then remove all the paint—especially if the bike has about four coats of barn paint applied with a broom. If the finish is only what is left of the original baked-on coat, then you can get by without completely removing it by doing an A-1 sanding job.

Clean surfaces are a must. Paint remover carries a wax to make it act longer. You must get rid of all the wax, grease, and fingerprints—which you can't see! Another thing about remover—if you smoke or use it near a lighted furnace, you'll have wild excitement instead of quiet fun.

About the finish itself—bike stores sell enamel for the purpose, so do mail-order houses. Or you can use Enamel-oid (Sherwin-Williams), Duco (duPont), or Waterspar Enamel (Pittsburgh). A ½ or even a ¼ pint will do nicely, with some left for touching up. Use colors; it is hard to make black look right. Gloomy too!

If you use a "4-hour" enamel, leave it several days before reassembling the bike, otherwise the enamel may be soft enough to fingermark.

If you want to try adding stripes, use thickened enamel, apply it with a striping brush if you can get one, otherwise get the small brush from kid sister's paint box. Use a wooden guide with its edge cut away so it doesn't touch the line being applied. Practice first on water pipe, to get your technique right.

Get the handlebars, post and stem nut replated.

If you are painting bikes on a commercial scale, use finishes more appropriate to commercial methods than the ones mentioned here.

1 Apply paint remover—(Strypeeze, Taxite, etc.) with a brush. Leave it a half hour in the shade.

2 Scrub off the softened paint with a wire brush. Repeat several times if necessary.

3 Remove the wax left by the paint remover with pure naphtha, NOT with leaded gasoline. Clean up greasy places—the crank hub, rear fork tips, etc.

4 Sand any rough spots—especially rusty ones. The whole thing must be clean and smooth.

5 Hang up the parts in the shade away from dust and paint from the top down.

WEATHERPROOFING YOUR BIKE

If you ride rain or shine, your bike can still look new—but it takes attention. You can apply clear lacquer such as Sherwin-Williams' "Rexspar" to the plated parts but they should be lightly sanded with a very fine emery cloth first. Or, go over the plated parts with oil or floor wax. Include the spokes; they get spray from all the puddles (so do you!).

The saddle can be kept in shape by rubbing in Saddle Soap or Dubbin, sold by your shoe store. (The Saddle Soap isn't soap, and it was designed for horse, not bike saddles.)

Don't leave your bike in the rain if you can help it.

STORING YOUR BIKE

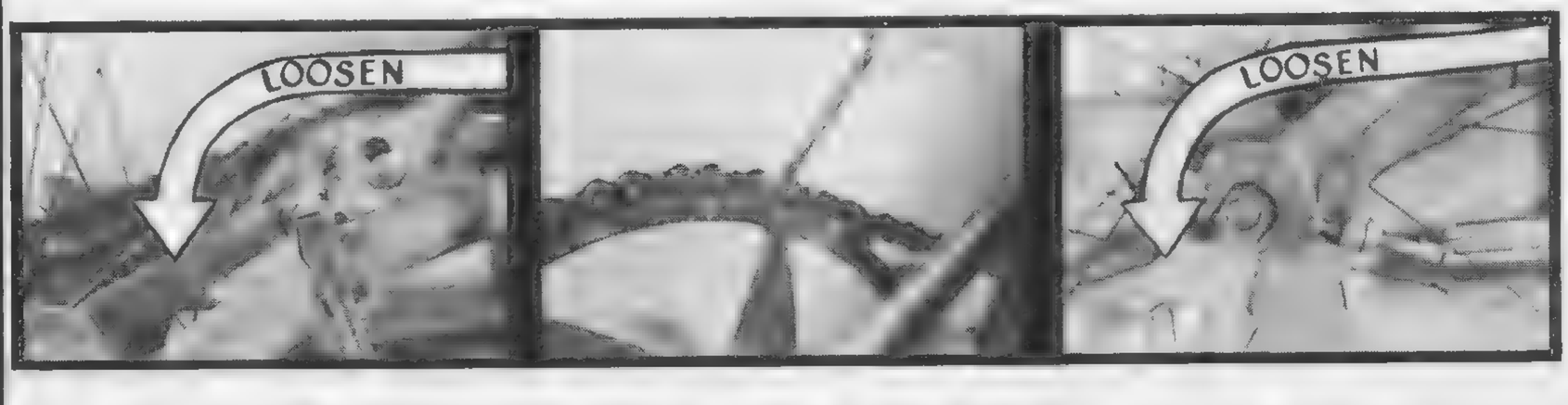
No, this picture is not upside down. These bikes are asleep (like bats) for the winter. They are hung on rubber-tube covered, 4-inch nails driven into the sides of the garage roof joists. This preserves the finish and tires, and keeps the bikes out of the way.

The Back Wheel

GETTING THE WHEEL OFF

Turn your bike upside down, with the back fender resting on a box. Don't dissect your bike on the lawn—lost parts get into the lawnmower. So, put all loose parts in a can. While the wheel is off, true it up, fix and tighten the fender, clean and oil the chain.

Now Tuffy, our southpaw mechanic swings into action.



1 First undo the brake arm, hold the nut and unscrew the bolt. Leave nut and bolt in the clip.

2 Disconnect the chain by its removable link and take the chain off. The next page shows how.

3 Take the axle nuts, washers and fender stays off the axle. Lift wheel out of the fork tips.

PUTTING THE WHEEL BACK ON

Important things in putting on a back wheel:

1. Bearing clearance
2. Wheel centered in fork
3. Correct chain tension
4. Fender centered over wheel

The bearing clearance can and should be adjusted while the wheel is off if the brake has a lock nut on both sides —see the coaster brake pages. Lacking a lock nut on the sprocket side, bearing clearance can be adjusted only with the wheel on the bike, see 3 and 4 below. Adjusting the chain tension is explained on the next page, which includes the final steps in centering the wheel, etc.

1 Place the wheel in the fork tips, put fender stays, washers and nuts loosely on the axle.

2 Attach the brake arm to its clip loosely. Tighten it after axle nuts are finally tightened.

3 Tighten the nut (brake arm side) to hold wheel while the cone is adjusted for bearing clearance.

4 Screw in the cone (on sprocket side) barely tight, unscrew it 1/4 turn. Tighten the nut.

The wheel should now turn by weight of the valve stem alone, but not rattle on the axle. If there is more than the slightest sideways play, loosen the nut, tighten the cone 1/16 turn, tighten the nut and try the wheel again. Keep at it till it's right. Now note the cone wrench position, to check it when the axle nuts are finally tightened.

Now proceed with adjusting the chain—next page.

The Chain

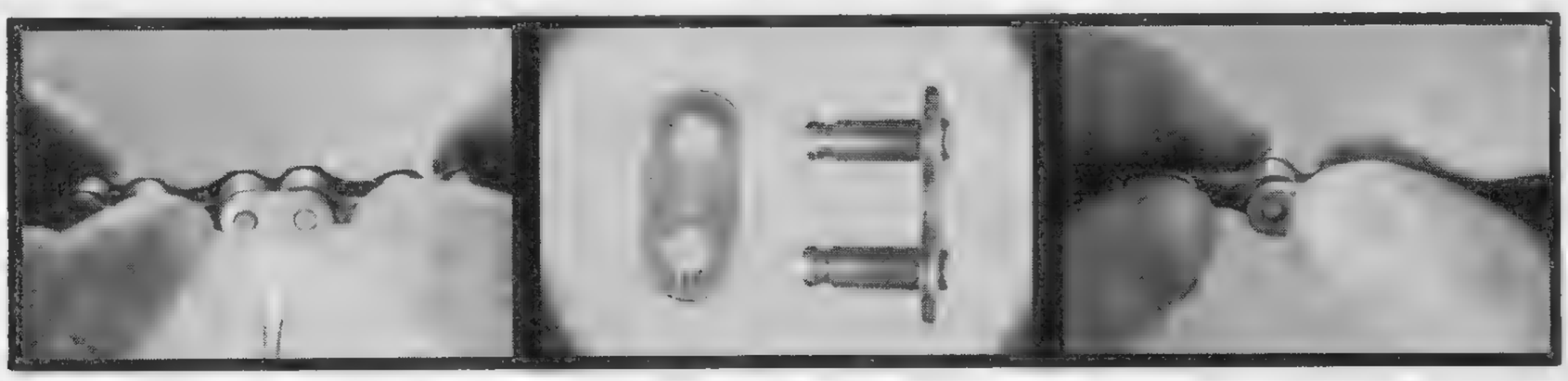
How smart are you? Is your chain a 1-inch or ½-inch pitch? You don't know? The 1-inch is commonest in U. S. A., the ½-inch in Canada, and every second space (one inch apart) engages a sprocket tooth. Every space in the ½-inch chain (½ inch apart) takes a sprocket tooth. The ½-inch chain is narrower (has shorter rollers) than the 1-inch. Neither chain can be used in place of the other, nor can repair parts for one be used for the other.

The chain must be disconnected to get it off the bike; there is a removable link for this purpose. The two types shown here are for the 1-inch chain, the chain with ½-inch pitch takes a different link. A spare removable link and long link come in handy.

A dry chain is second only to a soft balloon tire in making a bike hard to pedal. The chain needs oil inside the rollers and stick graphite outside—it won't collect grit. The graphite can be applied with the chain in place.

A loose chain is exciting—it may come partly off the rear sprocket, jam there, then you can't use clutch or brake. This also breaks the chain on one side. Another way to break a chain is to ride without a chain guard wearing floppy slacks, which get caught between chain and sprocket—good for the slacks, too.

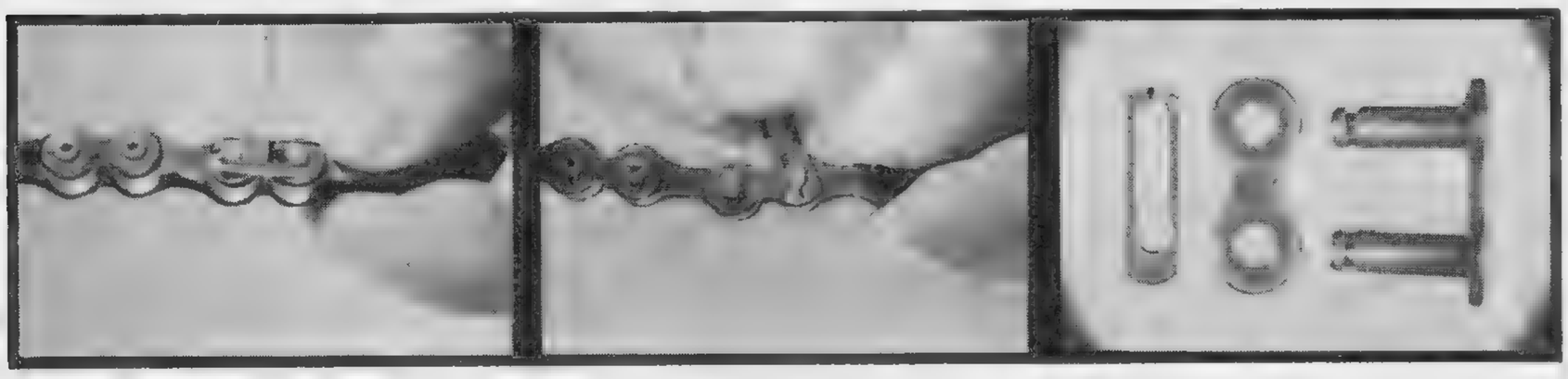
DISCONNECTING THE CHAIN — Two Types of Link Plate



1 Flex the chain to free the link plate, pry it off. Easy if you do it right!

2 Push out the link post (right). Don't lose these!

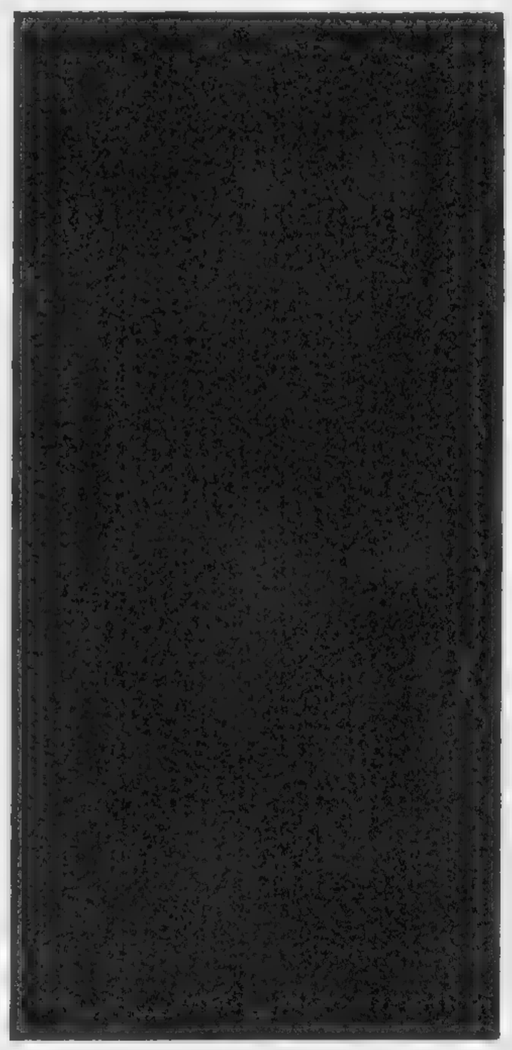
3 To reconnect, replace link post, flex the chain, press the link plate on.



1 Pry off one side of the spring lock at the split end.

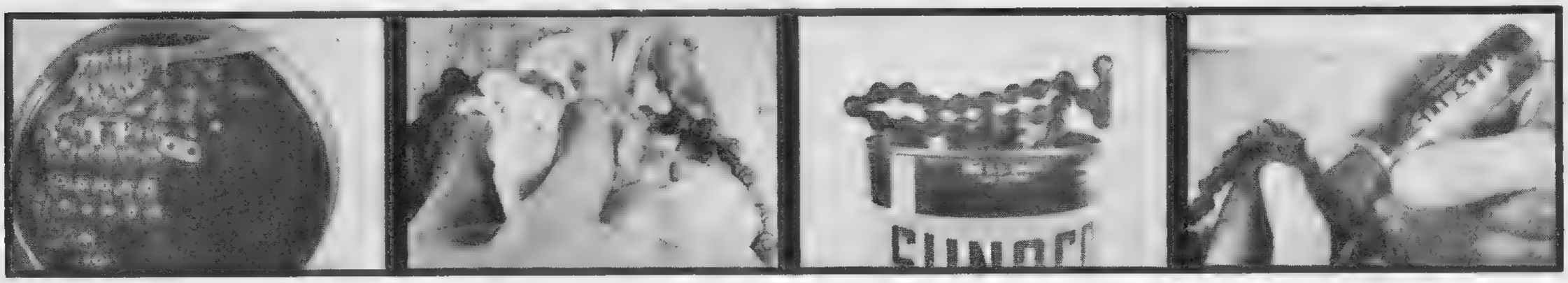
2 Swing the other side away from the post, twist it off other post.

3 Take off the link plate, push out link post. Replace in same manner.



Chain draining overnight.

OILING THE CHAIN



1 If the chain is dirty (it is!), soak and scrub it in kerosene.

2 Blot it on a guest towel (use a rag if you have guests).

3 Dunk all of it in No. 30 oil a few minutes. Hang it to drain overnight.

4 Blot it again, goo the rollers with graphite (auto supply stores).

FIXING THE CHAIN

Don't continue to ride with half a link broken. The other half will go when you want to stop in the worst way—which you will then do.

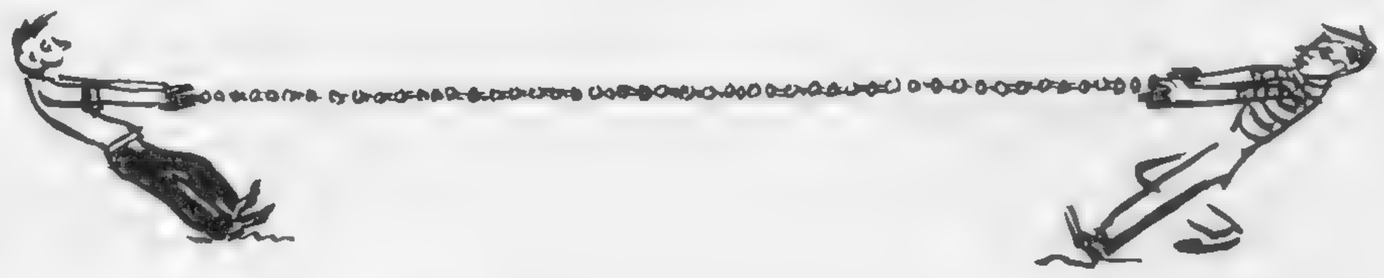
Get the parts you need, including spares. Take off the chain (if not already off!), carry out the repair operations on a metal block or vise.

1 Drive the posts out with a nail and hammer, link supported on nuts.

2 Replace the broken link with a similar one.

3. Drive the posts back in. Start them straight.

4 Rivet over both ends of both posts, but not enough to bind the link.

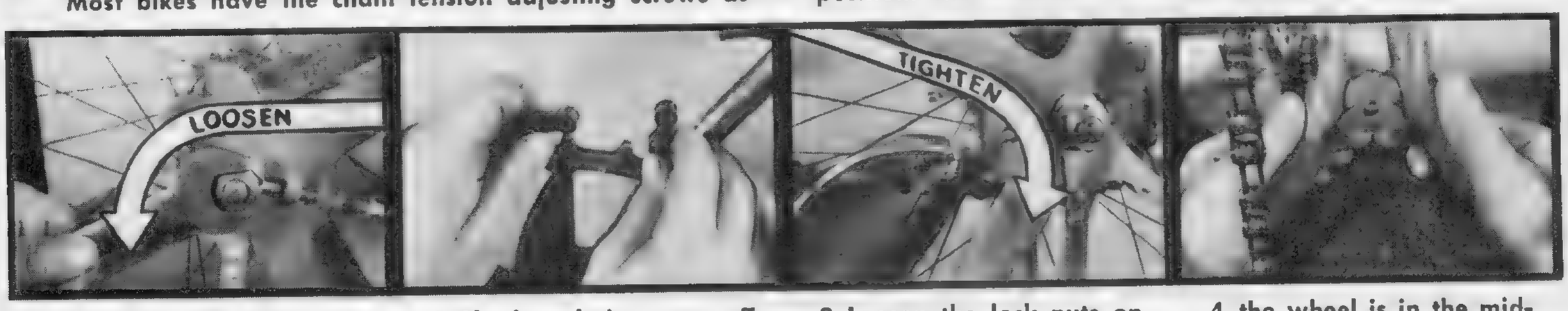


ADJUSTING CHAIN TENSION

The bearing clearance must be made right before the chain is adjusted, because pushing the bearing cone inward tightens the chain. If you had the wheel out, adjust the bearings according to the coaster brake pages. If the wheel was not off, or if there is no lock nut at the sprocket side, adjust the bearing cone as explained on the back wheel page.

Most bikes have the chain tension adjusting screws as shown here. If your bike has no provision for them, or if you can't get the right size, your bike may take the type that loop over the axle and pull backward toward the fork tips. They fit most bikes.

Most used bikes we have seen have decentered pedal sprockets—the chain tension changes as the sprocket turns, and the tightest chain tension occurs at a certain pedal position. The treatment shown in 7 may work, try it.



1 Loosen both axle nuts. If there is no lock nut, first note the bearing cone position by putting a wrench on it.

2 If the chain was off (we hope you oiled it!) wrap it around both sprockets, put in the removable link.

3 Loosen the lock nuts on the chain tension screws, be sure both screws touch the axle and adjust them till

4 the wheel is in the middle of the lower fork. Allow for wobble—spin the wheel and see where it comes in the fork.

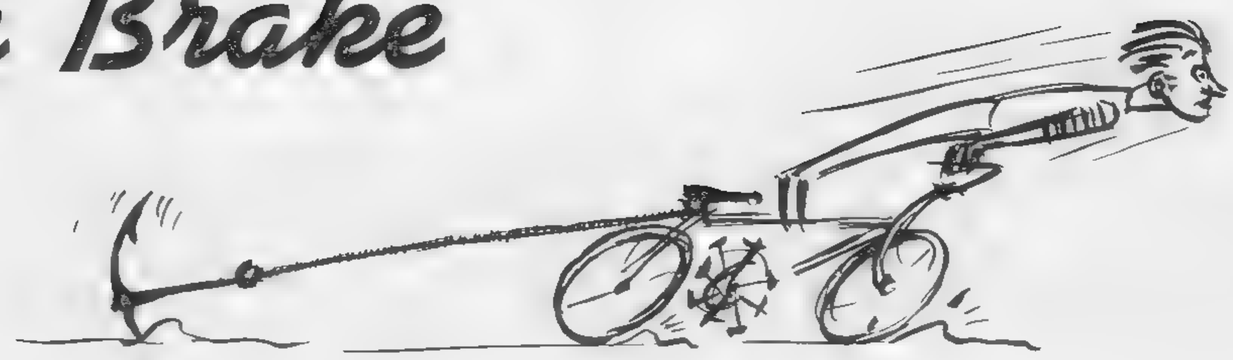
5 Now adjust the chain tension screws equally (½ turn at a time) till chain has ½-inch slack (total movement) in its middle. Tighten the tension screw nuts.

6 Turn the big sprocket slowly and feel for any change in chain tension due to a decentered sprocket. At its tightest, the chain must have ¼ inch of slack.

7 Decentered sprocket? Turn it so the chain is tightest, hammer it toward the back wheel through a hardwood block. Hit it harder till the chain tension slackens.

8 Tighten left axle nut. Be sure the wheel still centers in the fork. Hold the cone in its correct position (see 1) and tighten the right axle nut.

Your Coaster Brake

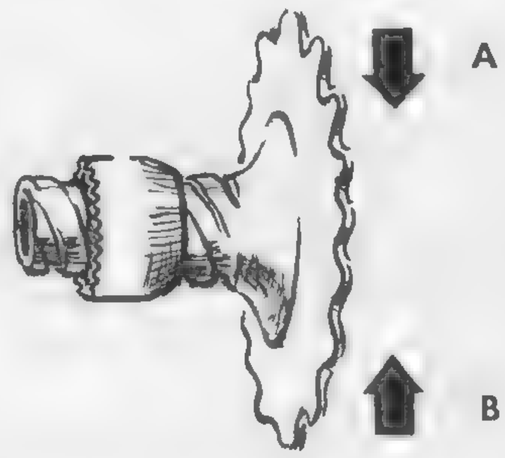


HOW IT WORKS

Dad once took Junior's brake apart with the idea of fixing it. He was confronted with an amazing multitude of nasty little pieces, so—ahem—he really didn't have time right now to work on it, so he took the whole mess down to the bicycle repair shop. Had he known how the thing really worked, his mechanical know-how would have helped him through. But a mechanical ignoramus should take the bike to the repairman before dissecting it.

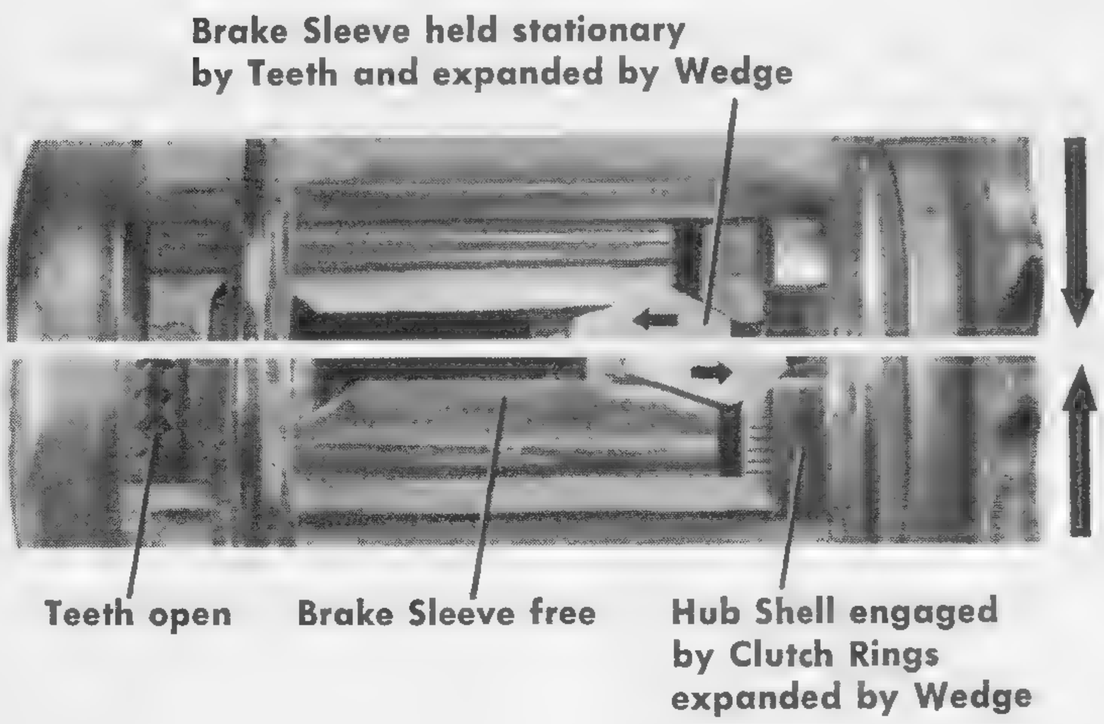
The heart of the American bike is the back wheel hub—the coaster brake. Inside the coaster brake there is fixed to the sprocket a large screw ("driving screw") with a fast thread. On this thread is a loosely fitting clutch part. When the sprocket is turned forward, a slight amount of drag between the clutch part and the stationary axle makes this part run up the thread toward the sprocket end. This engages the hub shell to drive the bike forward; the clutch action comes from the clutch wedging itself or other parts against the inside of the hub shell so that the hub turns with the sprocket. When the sprocket is turned backward, the drag between the clutch part and the axle makes the part run down the thread to its far end thereby engaging the brake. The braking action comes from the part expanding the stationary drum or sleeve against the inside of the hub shell (Morrow and Elgin Brake). In another type of brake (New Departure), the brake action comes from squeezing together a pile of disks some of which fit the hub shell and turn with it, and the interleaving disks are held stationary by the disc sleeve. The drag against the clutch part is what makes the brake take hold when it should, and this drag must be greater than the friction of the part on its thread. If there were no drag, the part would just turn with the sprocket, and not run along the thread. Then it would not work either clutch or brake. In the Morrow Brake this drag is caused by the stationary "retarder washer" rubbing against a part linked to the clutch part. In the New Departure Brake the drag is caused by the "transfer spring" which is always linked to the clutch part, rotates with it, and rubs against a stationary part. The action of these brakes can be understood (we hope) from the cutaway views showing the driving and braking positions and from the exploded views you will see in the following pages.

When sprocket turns in direction A, clutch part moves to the left and engages the brake.

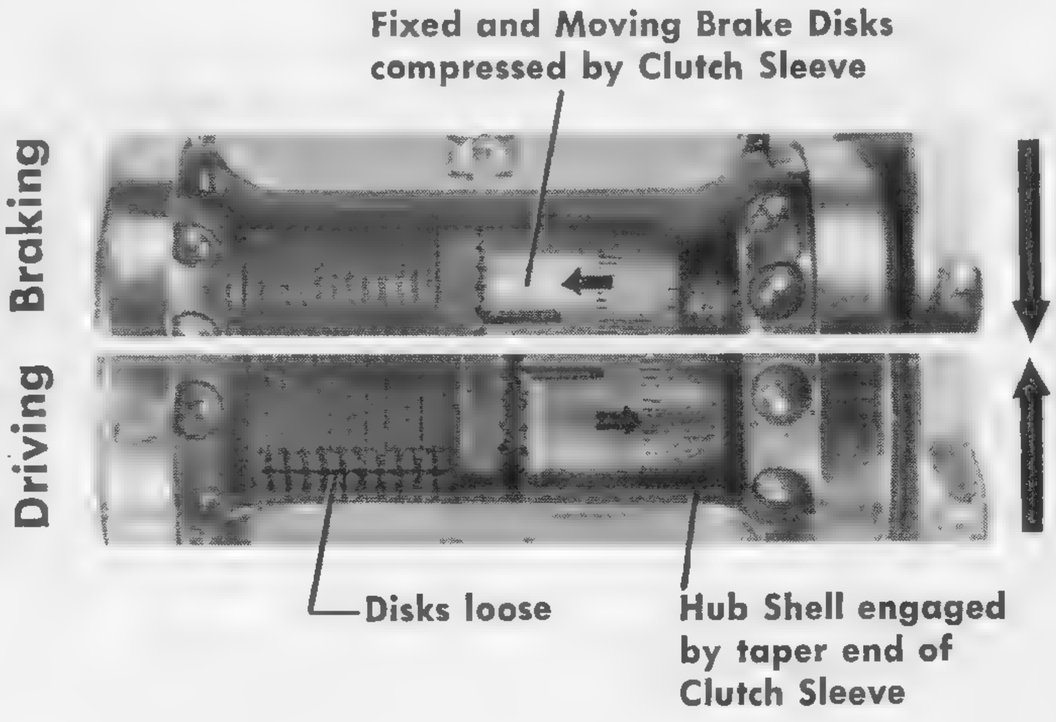


When sprocket turns in direction B, clutch part moves to the right and engages the hub shell to drive forward.

MORROW BRAKE



NEW DEPARTURE BRAKE



LUBRICATING YOUR BRAKE

Coaster brakes, as they come from the factory, are lubricated and will work well for a long time. If the brake is used a lot, it should be oiled through the oil cap on the hub shell (if present) twice a season with motor oil, SAE 20 or 30. If the brake is used in hilly country, oiling is needed oftener, even monthly. Don't use a lot of oil, and, above all, don't use light household or gun oils, or the grease will be washed out of the brake.

After several seasons (one season for a very active bike) the brake needs cleaning and relubricating. If you aren't smart with gadgets don't tackle it yourself. Do your mechanical teething on something cheap like a pedal.

The following pages show how to take apart and relubricate the three common brakes. The most important parts to lubricate are the ball bearings. Lubricant for ball bearings must not be so firm that the balls "channel" it (cut holes) and get no more on them, or so liquid that it soon runs out. So use a ball bearing lubricant such as Andok "C," or Veedol V. C. Grease, or other meant for the job. Vaseline will do in a pinch.

SO YOU WANT TO FIX IT!

Look over the pictures and get an idea of what you are tackling. If you haven't done mechanical work before, don't start here.

Put all the parts in a can of kerosene as you take them off, or you will spend an hour looking for them afterwards. Scrub all the parts with a toothbrush (an old one, kerosene tastes awful!). When the parts are clean, dry them on paper towels, or in an air blast from a pump.

The main things in overhauling any brake are these:

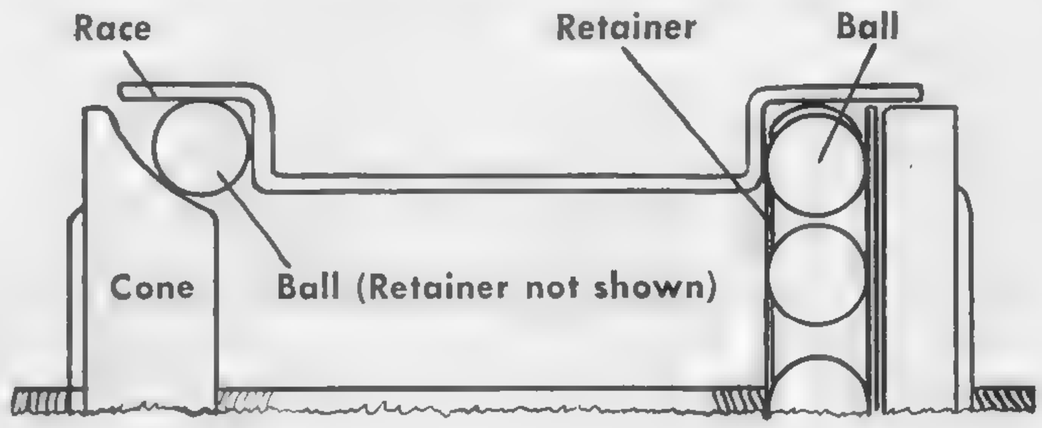
1. Replace broken or worn parts.
2. Clean and lubricate the parts.
3. Adjust the clearance (on a Morrow Brake).
4. Get the parts back in the right places.
5. Get the ball retainers right side out.
6. Adjust the bearing clearance correctly.

About Bearing Clearance—All ball bearings on a bike are adjusted by a "cone" which bears the inner surface on which the balls run. This surface is more or less cone shaped, so that screwing one cone toward the other tightens the whole bearing. The cone meant for adjustment has flat surfaces on its outside to take a wrench. A thin wrench is needed. Cones are shown in all the exploded views of brakes and other parts.

The bearing clearance is more important than you think. If too loose, there may be a 300-lb. pressure on each ball in turn. If too tight, all the balls are under terrific pressure. In either case, the cones will wear, and then the balls will smash up. The cone must be held tightly in place by its lock nut or axle nut. Lock nuts simplify adjusting the bearing clearance, and are highly desirable. Adjusting the bearing clearance is a little tricky, but not really hard. The axle should turn freely with no feeling of bumpiness, and it should always be tried with the lock nut tightened down, because the lock nut pushes the cone in slightly. This is shown in detail in the pictures that follow.

We assume that you have a vise. To clamp things like axles and driving screws without damage, cover the jaws with sheet copper. Unlike human false teeth, these jaws will not dent things. You can overhaul the brake without a vise, in which case adjust the bearing clearance when replacing the wheel in the bike frame as explained on the back wheel page.

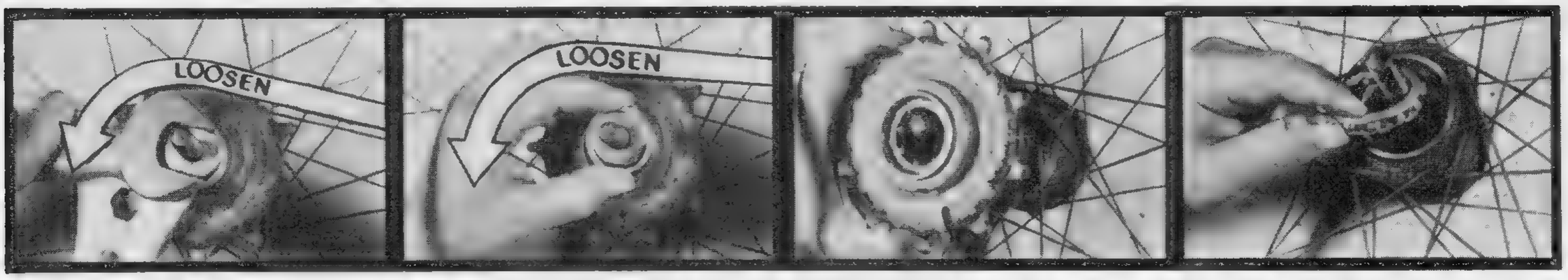
Now you are ready to dissect the brake itself, the most complicated thing on your bike. Good luck!



NASTY THINGS THAT HAPPEN

What's Up?	Look For
Pedals don't take hold forward at once, if at all.	• Broken transfer spring. (New Departure) • Worn clutch, or drag loose on spool. (Elgin) • Gummy grease or grit on driving screw. • Broken or worn clutch expander. (Morrow) • Damaged thread on driving screw or clutch. • Very loose bearing cone.
Pedals don't engage brake at once, if at all.	• Broken transfer spring. (New Departure) • Brake arm not properly on stationary cone. • Wrong tooth clearance or worn teeth. (Morrow)
Slow brake action.	• Smooth brake shoes. (Morrow—see pages on it) • Gummy grease on braking surfaces.
Cracking or grinding noises.	• Broken or worn balls, cones or races. • Chain too tight, badly worn or too much heavy grease. • Grit on braking surfaces.

MORROW BRAKE—Taking It Apart



1 Remove the lock nut on the sprocket end.

2 Unscrew the cone. Put all parts in kerosene.

3 Now lift out the sprocket assembly.

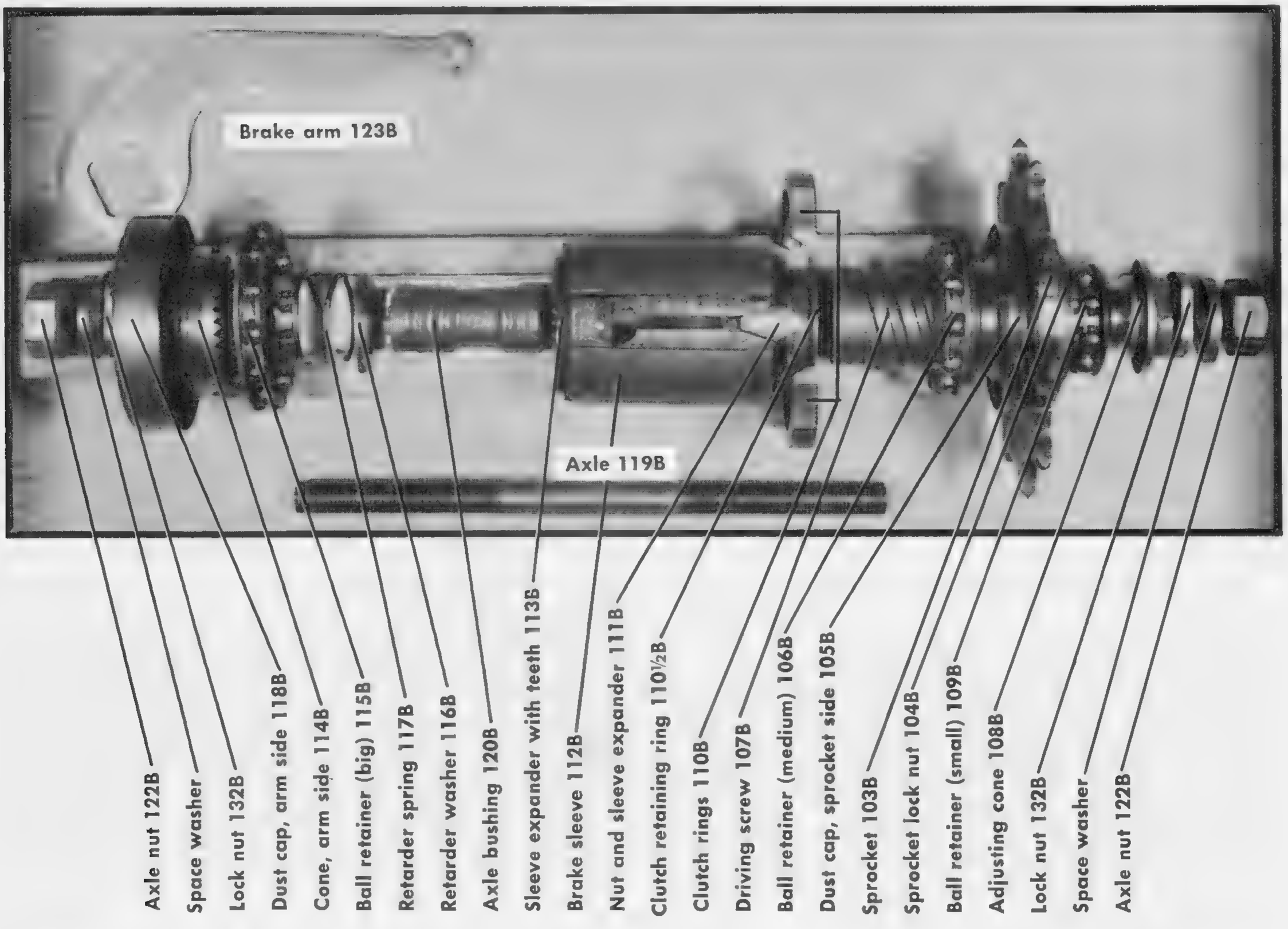
4 Take out the large ball retainer.

5 Lift the wheel off the other brake parts.

6 Remove brake sleeve and ball retainer.

7 Take off lock nut, brake arm, and cap.

8 Leave this assembled, see next page.



Exploded View ● The brake sleeve, expander and nut are still assembled; so are the driving screw, sprocket, dust cap and lock washer.

The brake shoes on older brakes may be smooth and slow in braking action as the grease takes time to squeeze out. Get the new type multi-grooved brake shoe, or put four grooves in each shoe if you are good! Then you can stop fast.

1 To remove end parts, pull pins with cutters. If new type, expand sleeve by screwdriver.

2 Put 4 grooves in each surface with a file or saw guided by a clamped wood block.

3 Better still, fit a table saw with a V-edge (saw sharpening) grinding wheel.

4 Use the saw slot and the rip fence for positioning the brake sleeve for grinding.

Look For Damaged Cones, Balls, and Races, which are caused by bearings being too tight or too loose. Cones go first and show rough spots, pits, or battered areas. Replace all damaged cones, races, and ball retainers which let balls fall out. Replace any other worn parts.

1 Badly worn cone showing rough area.

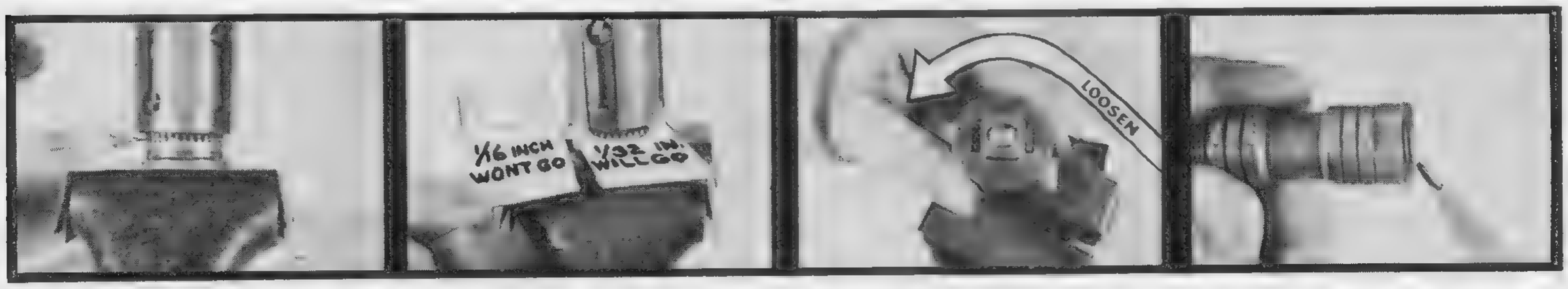
2 Pitted cone — is noisy and will cause further damage.

3 Hub shell with worn and cracked race. Get a new one.

4 Damaged retarder washer chewed by metal particles in neglected brake.

Putting It Together

Be sure to get the clearance between the stationary and moving teeth right (1-7). Lubricate everything as shown, and be sure all three ball retainers are smooth side out. Also be sure to get the bearing clearance right (25-28).



1 Put the sleeve in place, check this clearance.

2 Must be less than 1/16", more than 1/32".

3 If it is wrong, take apart the cone assembly.

4 Leave the axle bushing this far on the axle.

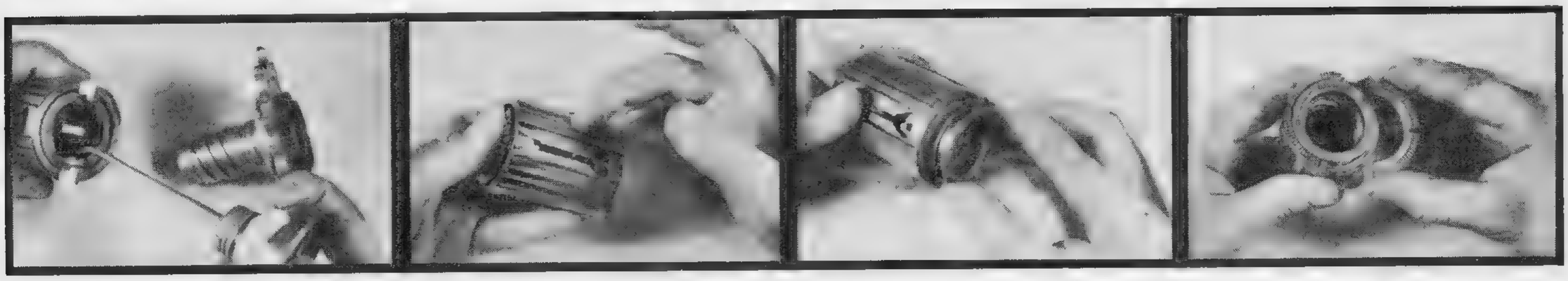
5 Add the retarder washer, bevel side toward the bushing.

6 Thread the axle into the cone while pushing against the spring.

7 Check the clearance. If tight, unscrew axle, reenter ½ turn slacker.

8 If clearance is OK, screw the cone on the axle about an inch.

Putting Morrow Brake Together (continued)



9 Put drops of light oil (SAE 10 or 20) on driving screw and nut.

10 Put good medium auto grease thinly on brake shoes and wedges.

11 Slip the clutch retaining ring in place.

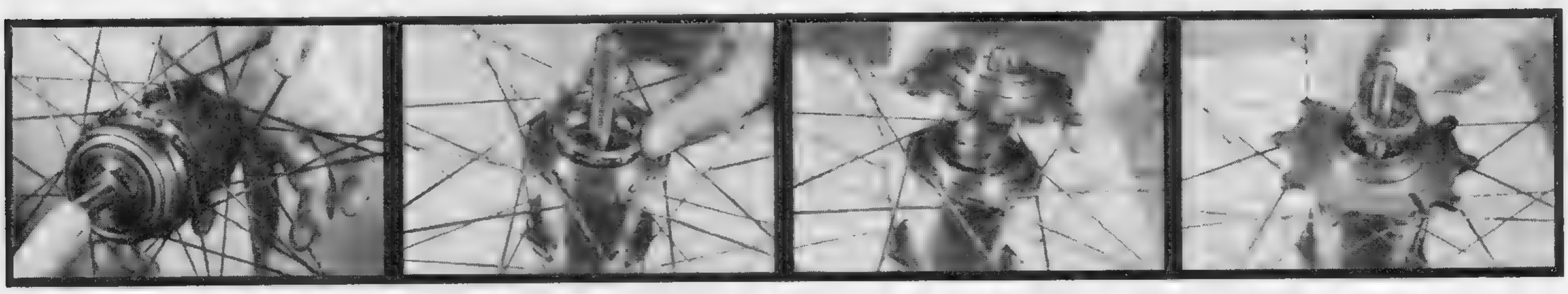
12 Add both clutch rings, rough side out.

13 Hold the clutch rings, drop assembly into hub.

14 Fill all retainers with ball-bearing lubricant.

15 Add the biggest ball retainer, smooth side out.

16 Add the axle with the cone assembled.



17 Holding the axle in place, turn wheel over.

18 Add the medium ball retainer, smooth side out.

19 Add the sprocket. This is easy!

20 Add the small ball retainer, smooth side out.

21 Add the cone, tighten it by fingers only, loosen it ½ turn

22 Hold the cone. Tighten the lock nut against it.

23 Add the dust cap to the other end. Is ball retainer seated evenly?

24 Clamp the axle or nut in vise, add the brake arm, tighten it lightly.

25 Loosen the arm by ¼ turn, hold it there, tighten the lock nut against it.

26 Take the wheel out of the vise. Does the assembly turn freely without end play?

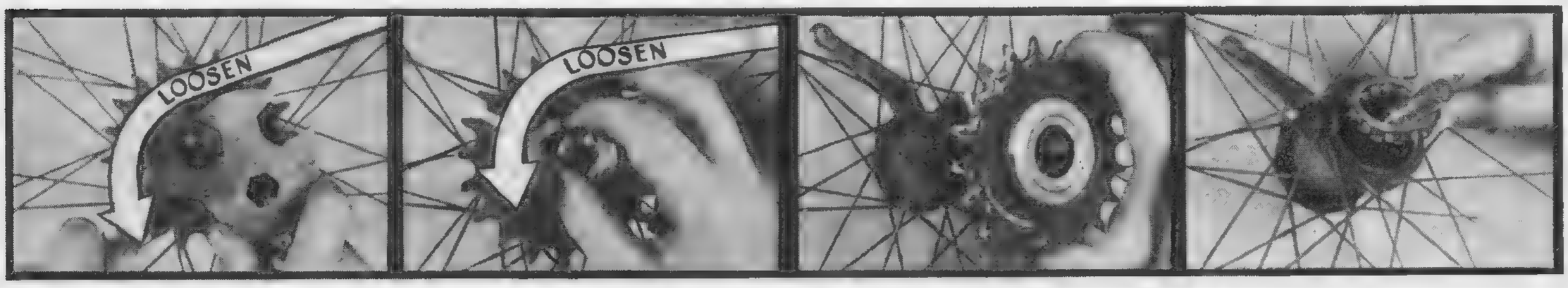
27 If you can feel any tightness or bumpiness, loosen the arm 1/16 turn, try it again.

28 If there is end play (it clicks when pushed endwise), tighten the arm 1/16 turn.

NEW DEPARTURE BRAKE—Taking It Apart

Oil it with engine oil (SAE 20 in cold weather, 30 when it's hot) through the oil cap on the hub shell, about twice a season. If the braking action is slow, squirt in some kerosene (not gasoline) to thin the oil on the brake discs, and spin the wheel several turns. If the pedals do not take hold backwards or forward, or if the action is uncertain, the transfer spring is broken—see next page. The wrong kind of grease on the driver (D-2) can also cause uncertain action.

Now, clamp the axle (arm end) in a copper-covered vise and proceed.

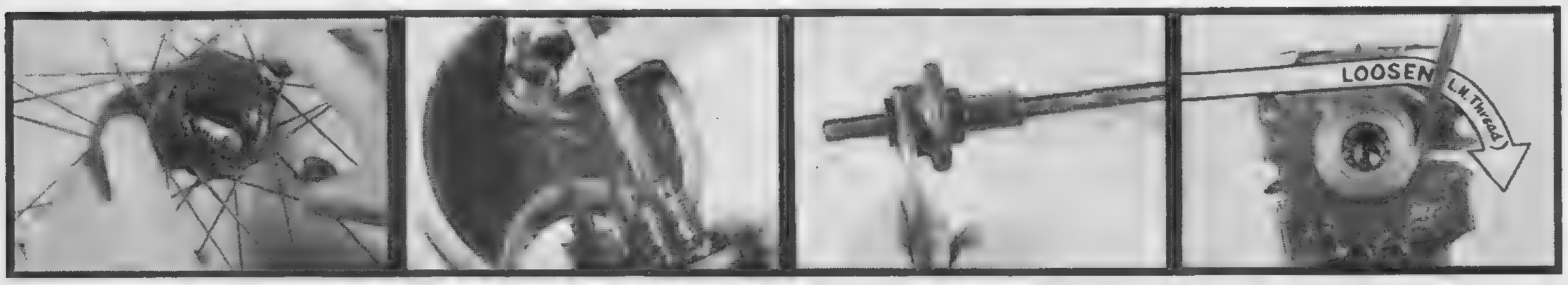


1 Remove the lock nut on the sprocket end.

2 Unscrew the cone. Use a wrench if you have to!

3 Unscrew the sprocket—no trouble at all.

4 Take out this ball retainer.



5 Lift the wheel off the rest of the brake parts. What a mess!

6 Take off the rest of the loose brake parts, put them in kerosene.

7 You need not take this apart unless the cone is worn rough on the bearing surface.

8 Remove the sprocket set nut by a spanner wrench or by hammer and chisel. Lift out the ball retainer.

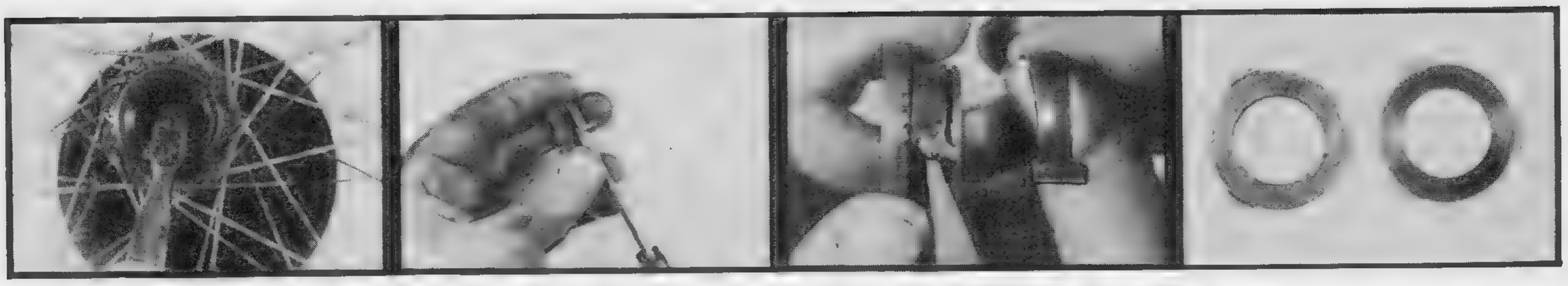
Exploded View

The driver, sprocket, and its dust cap are still assembled. Early models had only 12 brake discs and no separate dust cap, drum end. Brake disc sets have varied in number of discs, but a new disc set is interchangeable with every other set in use.

The transfer spring D12 on current brakes has a curved cross section which fits a curved clutch seat. Older brakes have a flat spring—get whichever one is indicated, and keep a spare.

New Departure part numbers are listed below.

Cleaning and Lubricating New Departure Brake



1 Soak and scrub parts in kerosene, including the inside of the hub shell.

2 Pry off the transfer spring with a small screwdriver. How is it?

3 This transfer spring is broken, the other is not. A few cents!

4 Badly scored brake disc, and good one. Get a new set. Quite cheap.

5 Grease all the three ball retainers with Andok C grease. Icky!

6 Grease the hub shell, transfer spring, clutch sleeve and brake clutch.

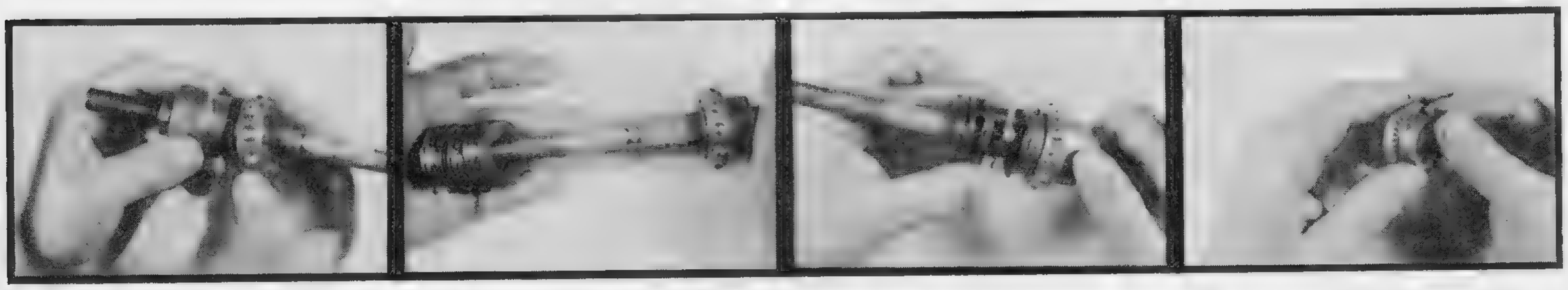
7 Oil the brake discs with SAE 30 oil. New disc sets come lubricated.

8 Put light oil (SAE 10) on the driver and clutch threads.

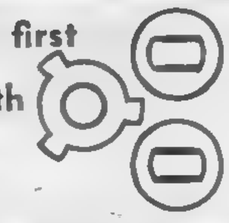
Putting It Back Together

The main trick here is in getting all the brake disc lugs into the hub slots (7-9). It is very simple if you have the Disc Assembly Tool D-25 (made by New Departure, sold by some bike dealers). This gadget clamps all the discs together and keeps the lugs lined up. Without this tool, the job takes longer and requires more care. If the last one or two lugs don't enter, the bearing is not seated, and you're headed for trouble. When they are all entered, the outside face of the ball retainer is below the end of the hub shell.

Steps 20 to 24 are most important—getting the bearing clearance right.

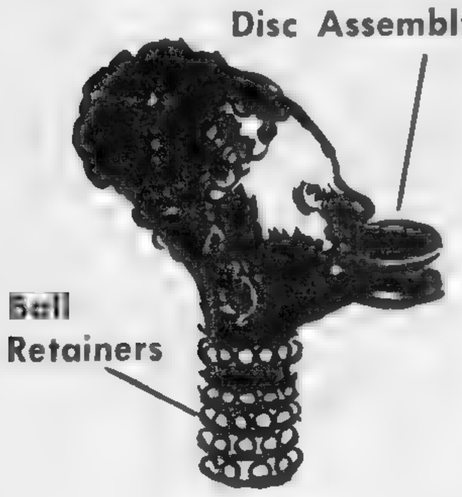


1 If it was off, screw the disc sleeve on axle 1¼", add large ball retainer.

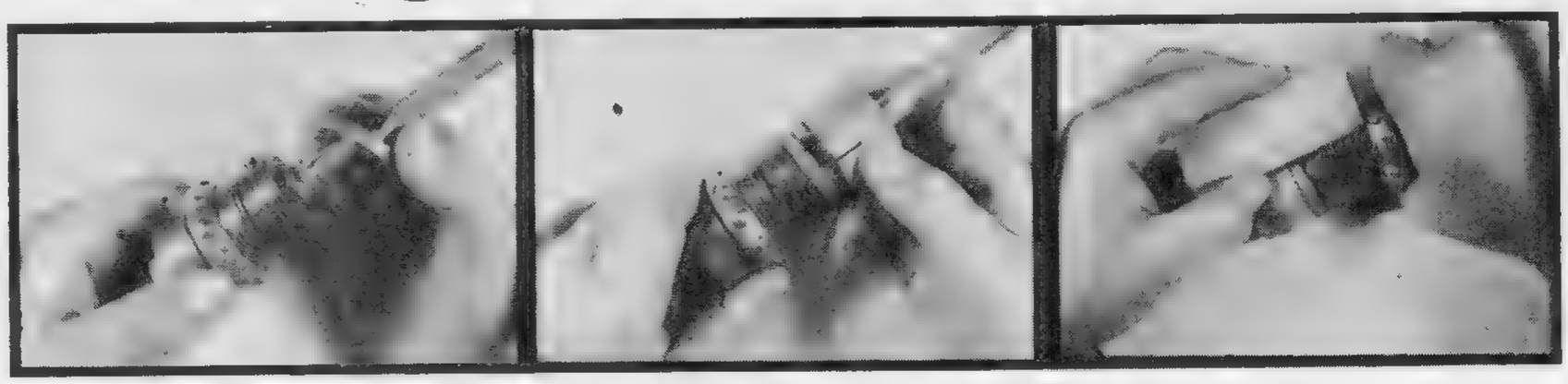
2 Add discs, first alternate with  the last one

3 Turn all  discs so they slide onto disc sleeve.

4 Add the transfer spring, lug side out. Use the right type. See exploded view.



"Old Family Retainer"



5 Add the brake clutch, with its flat side toward the brake discs.

6 Add the clutch sleeve, so the transfer spring lug fits in its slot.

7 Line up the lugs on the brake discs with the disc assembly tool or other straight edge.

8 Screw the disc assembly tool D25 on the axle to clamp the discs. This simplifies the next step.

9 Put all this into the hub, from the large hole side. Make all disc lugs enter the hub slots.

10 The ball retainer must seat inside the end of the hub shell. Now remove the tool D25 if used.

11 Hold the axle in the hub so the stuffings won't spill out and turn the wheel over.

12 Add the other large ball retainer, with its flat side out.

13 Clamp the driver in a copper-jawed vise. Add ball retainer, flat side out.

14 Add the sprocket set nut. Uh-uh, other way—left-hand thread!

15 Tighten it, preferably by a spanner wrench or hammer and cold chisel.

16 Hold the wheel by the axle in a copper-jawed vise, add the sprocket.

17 Add the cone, tighten it by fingers, then loosen it ½ turn.

18 Hold the cone by a wrench, add and tighten the lock nut by another.

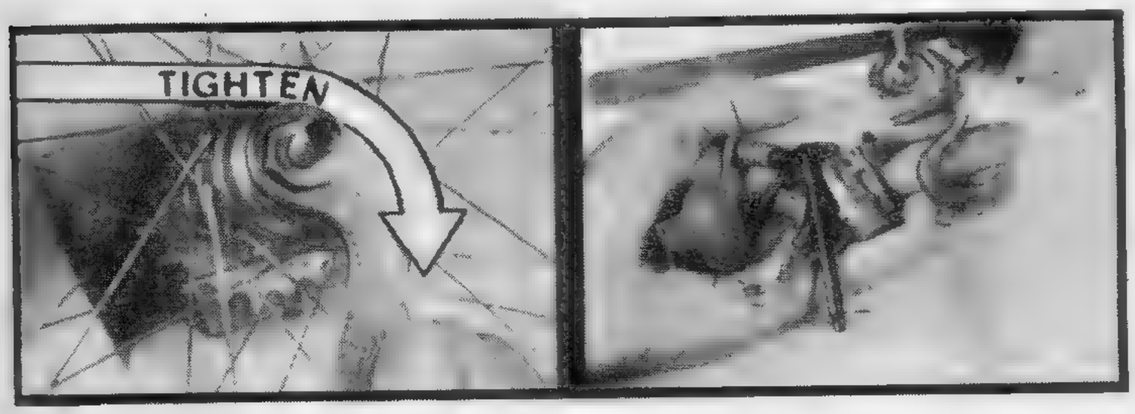
19 Turn the wheel over, hold bottom lock nut in vise. Add the dust cap.

20 Add the brake arm, tighten the cone with it by fingers only.

21 Now loosen the cone by ¼ turn by using the brake arm.

22 Hold the brake arm there, add and tighten the lock nut.

23 Take the brake out of the vise. Does it turn smoothly?



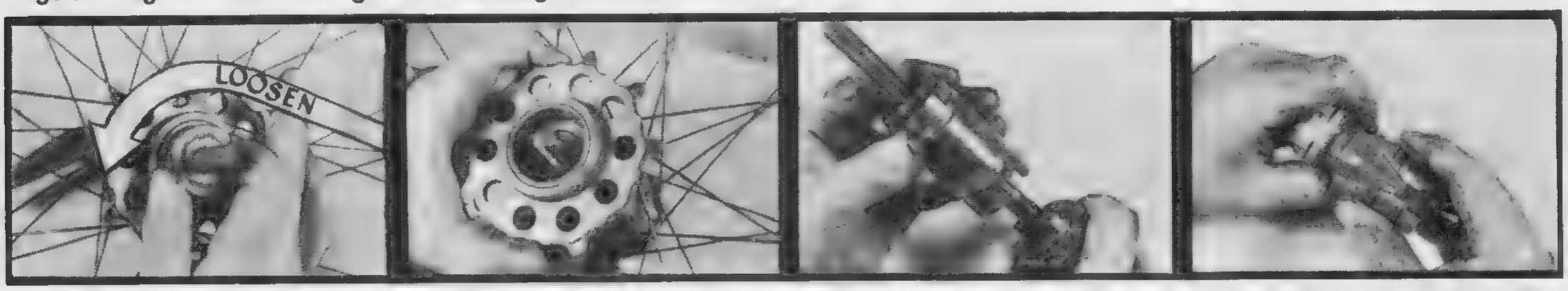
24 Tighten cone 1/16 turn if there's end play (it clicks if pushed endwise).

25 What about these left-overs? Nothing! They don't belong!

Steps 17 onward assume that the brake arm, dust cap etc., had been removed. Steps 20 to 24 show how to adjust bearing clearance—most important. If the brake arm is still on, adjust the cone (in 17), using two wrenches as in 18. Use the wrench on the cone in the same manner as the brake arm 20 to 24.

HIGGINS, ELGIN OR MUSSELMAN BRAKE—Taking It Apart

This is a very simple brake to take apart and get together again. You can't get the bearings on backwards. If it needs repair or cleaning, proceed this way:



1 Remove the cone. If present, remove the lock nut first, holding the cone with a second wrench.

2 Remove the sprocket. The drivescrew assembly comes with it.

3 Lift the wheel off the rest of the parts. Take the brake cartridge unit off the axle.

4 Pull the brake shoe off. Older models have a two-part shoe.

5 With a screwdriver, remove the spring from the older type shoes.

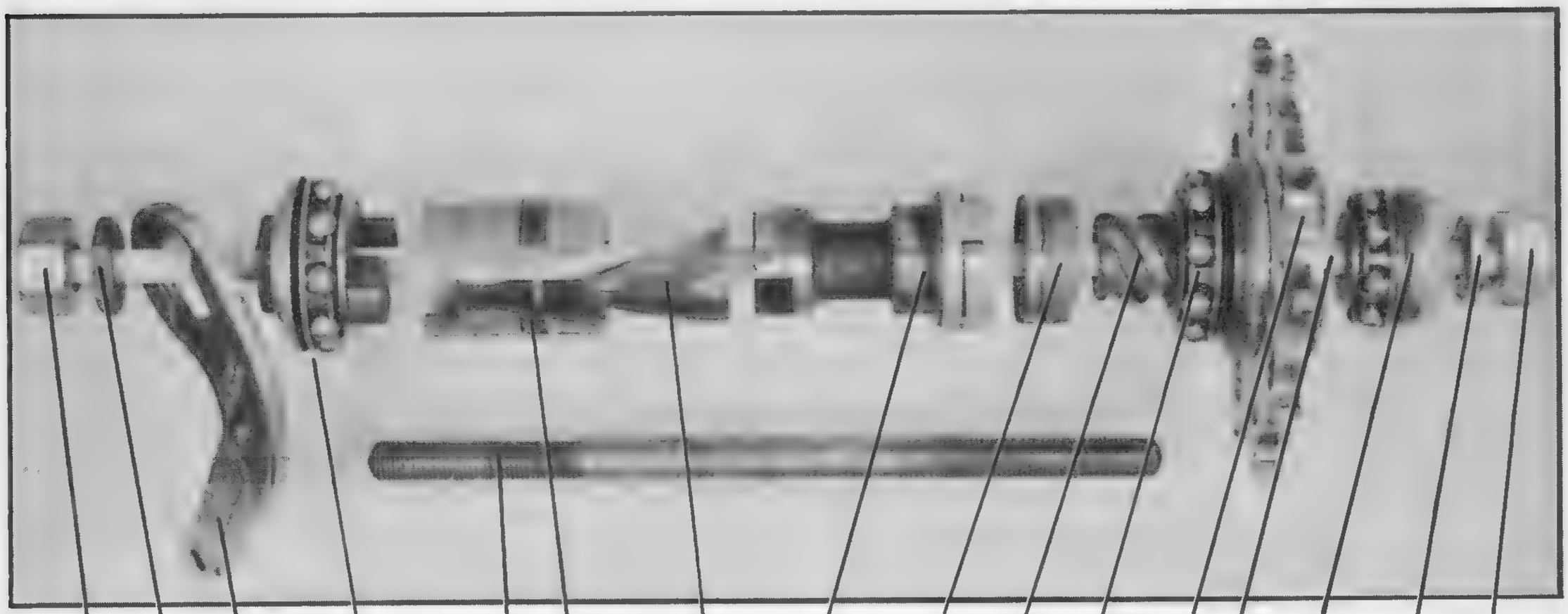
6 Pull out the driving clutch. Mechanic's tan!

7 Remove the lock nut from the brake arm end.

8 Unscrew the stationary cone. Soak and scrub everything in kerosene.

CLEAN the hub inside, and dry all parts on rags or paper towels. Now look for any part that is broken or worn.

Exploded View



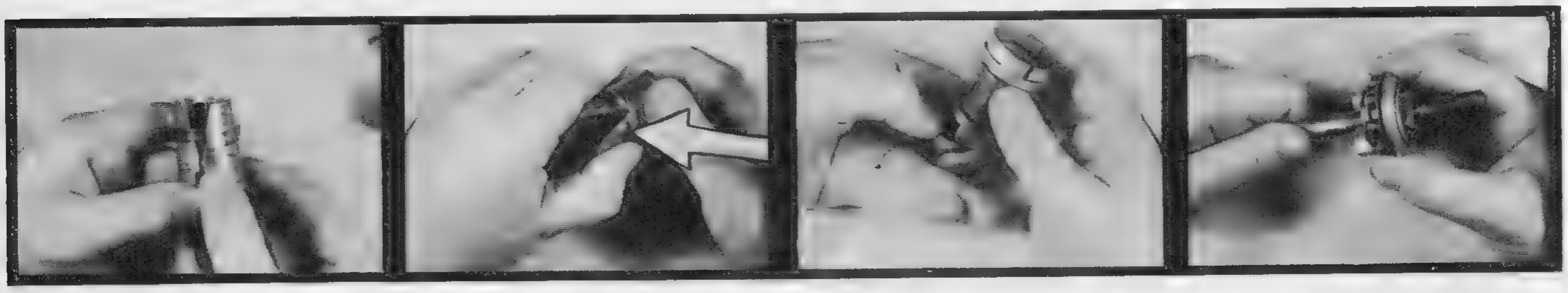
*These four parts come as a 'Cartridge Unit,' which replaces all wearing parts and simplifies reconditioning this brake.

Checking, Lubricating, and Putting It Together

If the clutch did not always take hold at once when pedaling forward, put in a new driving clutch, even though yours looks okay; it may be worn beyond its satisfactory life. If the drag is loose on the spool, replace the unit. If there were continuous ticking or cracking noises from the rear hub, look for broken balls, or rough or pitted races or cones. To see the cone bearing surfaces, you will need to pry off the caps which hold the ball retainers on the cones. The races are in the ends of the hub and in the outer end of the sprocket. If the bearings have been too tight, balls, races, or cones are probably damaged.

NOW, if all parts are okay, start reassembling.

THESE THREE STEPS apply only to older brakes with two-piece brake shoes.

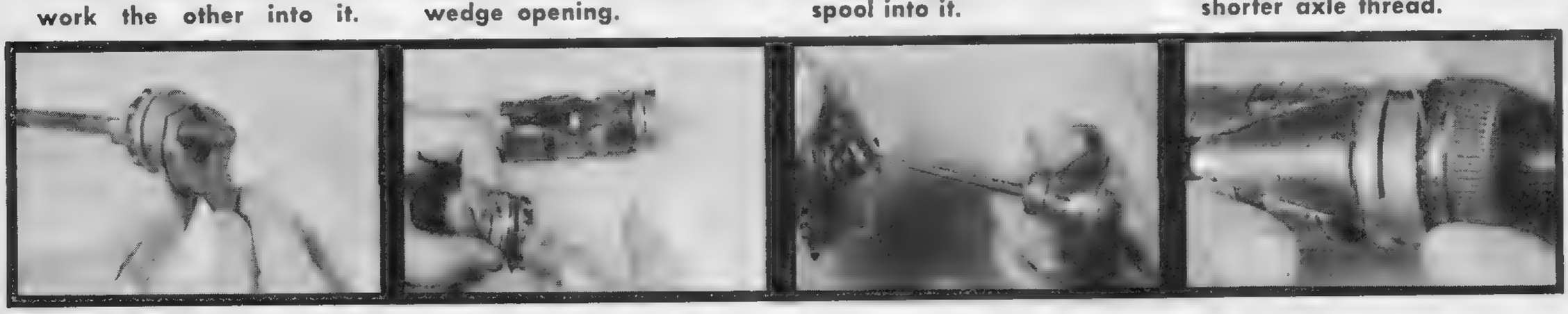


1 Put the flat spring around one brake shoe, work the other into it.

2 Shift the spring so its ends are away from the wedge opening.

3 Open the sleeve with the wedge, start the brake spool into it.

4 Screw the stationary cone to the end of the shorter axle thread.

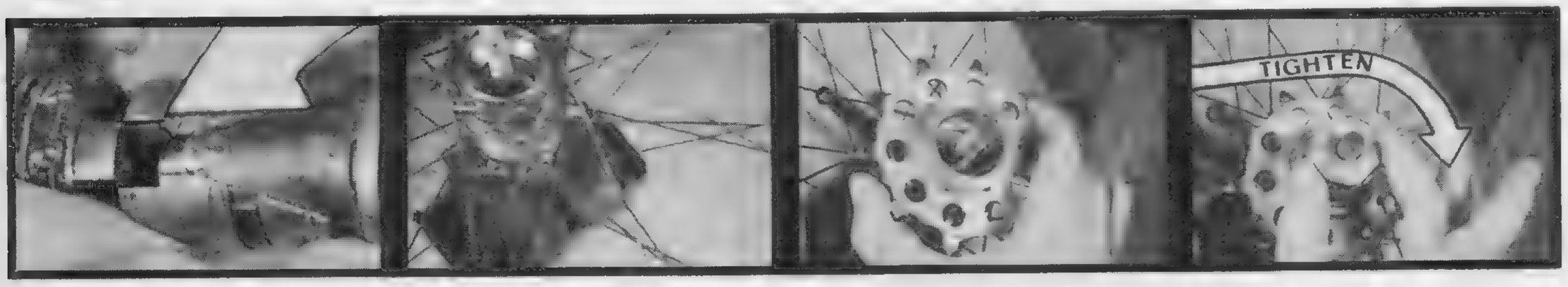


5 Add the dust cap, if it is off, then the arm, name side out, add and tighten the lock nut.

6 Lubricate all ball retainers, fill the spool with pressure lubricant, push the spool in.

7 Oil the driving screw and driving clutch thread with No. 10 SAE (light) oil.

8 Add the brake wedge and the driving clutch. Start the unit on the axle, clutch end out.



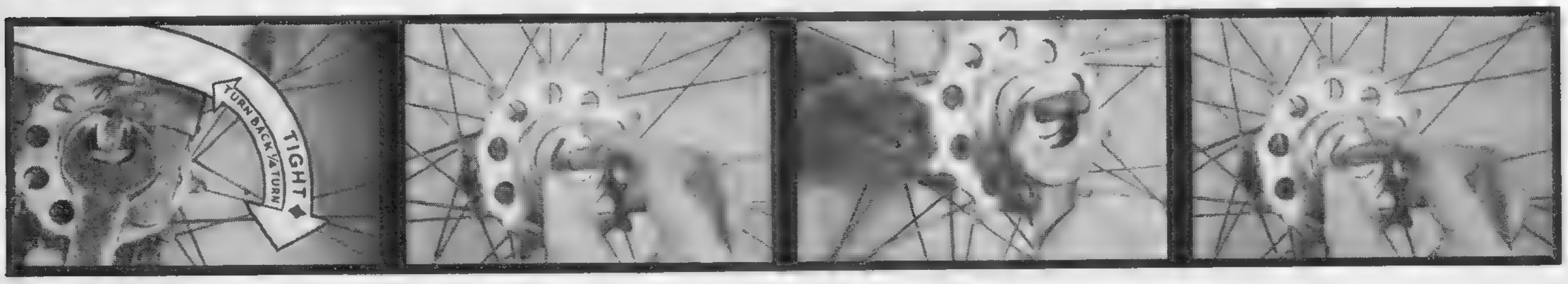
9 Line up the spool slot and sleeve slot to slip over the cone, lug!

10 Put the assembled brake into the hub from its big-hole side.

11 Add the sprocket and drivescrew assembly—duck soup!

12 Screw on the adjusting cone. Tighten it with your fingers only.

NOW put the wheel back in the frame and adjust the bearing clearance as shown on the back wheel page. But if you have a lock nut for the adjusting cone, it is better to adjust the bearing clearance before placing the wheel in the frame. Do it this way:



13 Clamp the left end of the axle in a copper-covered vise. Loosen cone ¼ turn, hold it there, add and tighten lock nut.

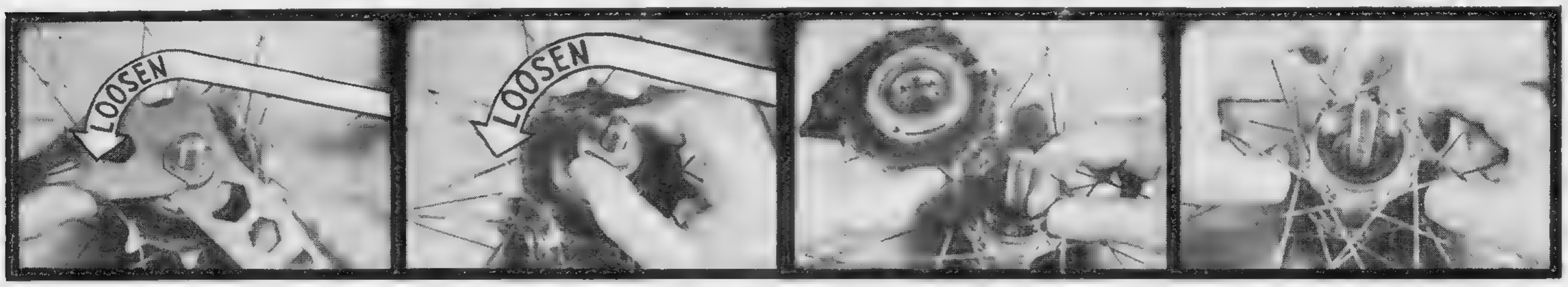
14 Take the wheel out of the vise, try the axle for ease of rotation and end play. It should move endways just perceptibly.

15 If it clicks quite noticeably when pushed endways, tighten the nut and cone about 1/16 turn while holding the brake arm. But if it binds or feels lumpy when turning, loosen the cone 1/16 turn. Keep trying it—correct bearing clearance is most important.

BENDIX BRAKE—Taking It Apart

This is a simple brake, easily taken apart and readily put together, but read "Your Coaster Brake" first. The braking action happens when a cone-shaped expander is pushed between the two brake shoes toward another cone-shaped expander, thus expanding the shoes outward against the hub shell. Don't confuse these cone-shaped expanders with the bearing cones.

Bendix and Morrow sprockets are interchangeable.



1 Hold cone with wrench. With another, loosen and remove the lock nut.

2 Remove cone. If axle thread has battered spots, use a wrench.

3 Unscrew the sprocket. Lift out the ball retainers in it and under it.

4 Lift the wheel off the rest of the brake. Things fall out when you do!

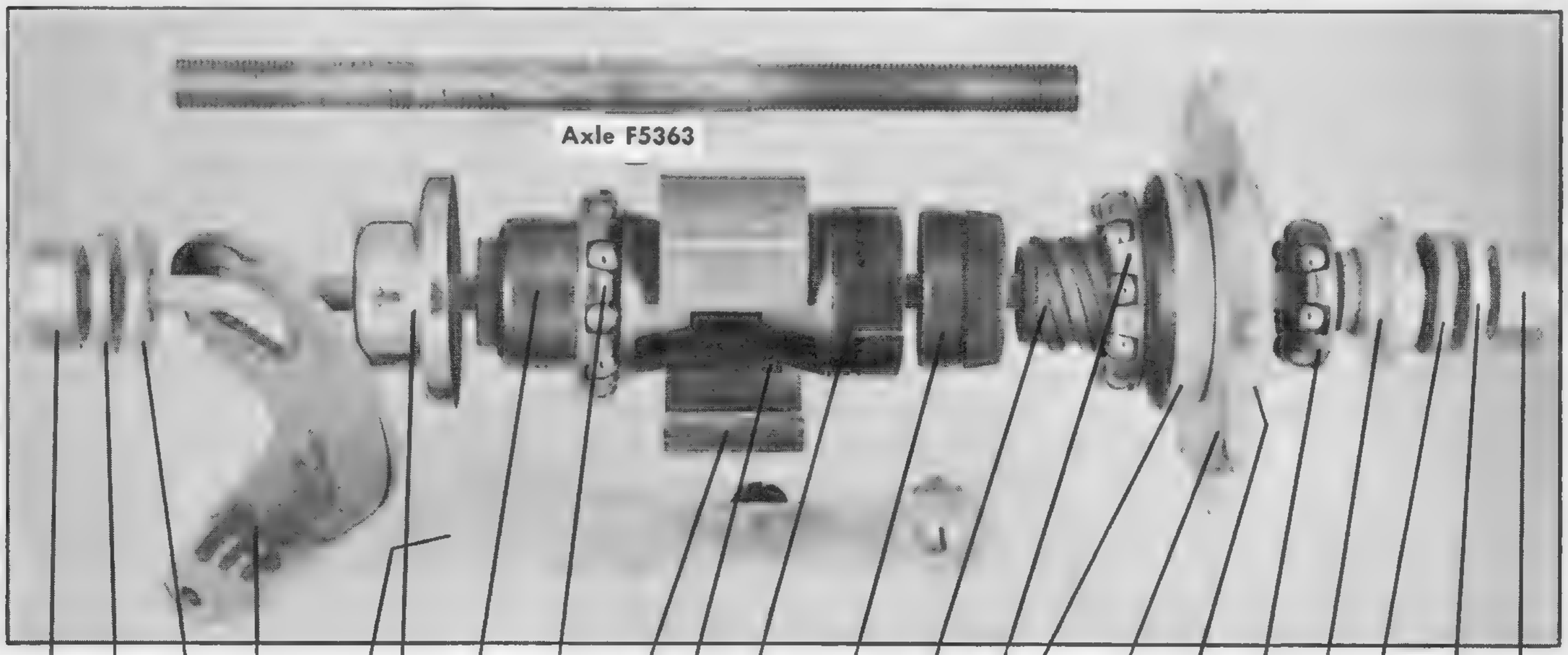
5 Remove this assembly from the axle, and pull the driving clutch out of the retarder assembly.

6 You only need take arm assembly apart to clean its ball retainer or check bearing cone surface.

7 If so, unscrew this part, rest it on bench, push ball retainer off evenly. Careful not to warp it!

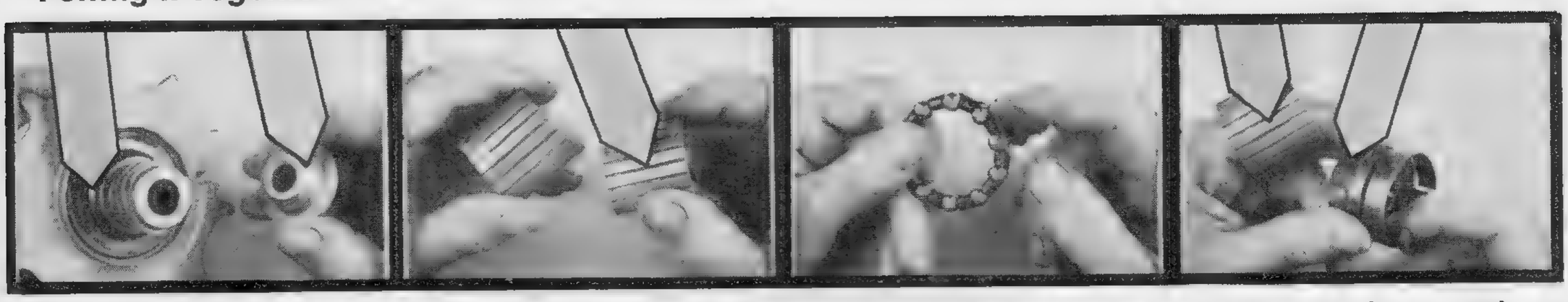
8 Soak and scrub all parts in kerosene. Clean inside the hub. Wipe parts dry or blow dry with a pump.

Exploded View



- Axle Nut F5365
- Axle Washer F5131
- Threaded Lock Washer F5364
- Brake Arm F5657
- Arm Clip F5657
- Dust Cap (arm side) F5379
- ASSEMBLED: Expander (arm side) F5309, Ball Retainer F5372
- Brake Shoes (2) F5376
- Brake Shoe Keys (2) F5377
- Expander and Retarder F5380
- Driving Clutch F5373
- ASSEMBLED: Driving Screw F5370, Ball Retainer F5372, Dust Cap (sprocket side) F5368, Sprocket (ten-tooth) F5080, Sprocket Lock Nut F5576
- Ball Retainer F5369
- Adjusting Cone F5371
- Threaded Lock Washer F5364
- Axle Washer F5131
- Axle Nut F5365

Putting It Together



1 Are these bearing surfaces smooth? (Check expander bearing surface also) If not, replace them.

2 Do the brake shoes still have deep grooves? If the grooves are disappearing —new shoes!

3 Apply ball bearing grease to all three ball retainers. Use lots! Don't lick your fingers!

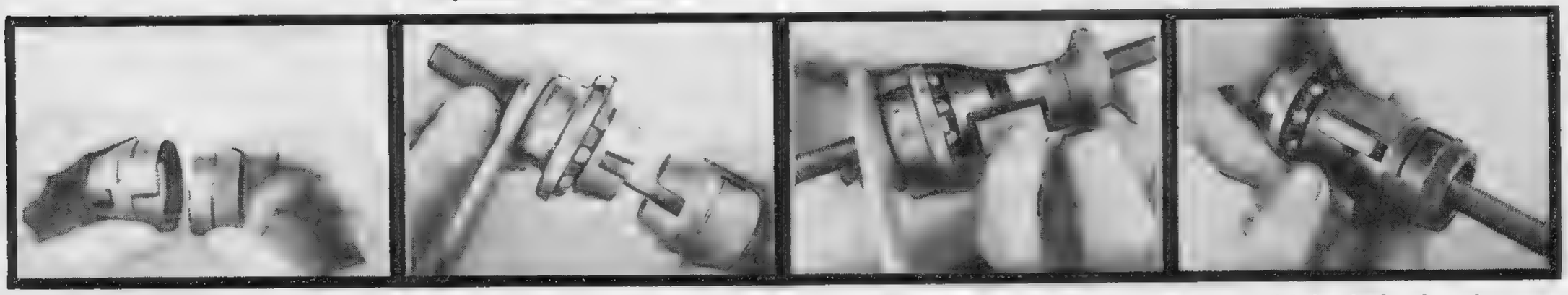
4 Grease the retarder, both expander faces, and brake shoes very thinly.

5 Put light oil (No. 10) on the driving screw.

6 Using dust cap, push ball retainer back on the expander, flat side out.

7 Screw the expander this far on the axle.

8 Add the dust cap, brake arm (name side out), add and tighten the lock nut.

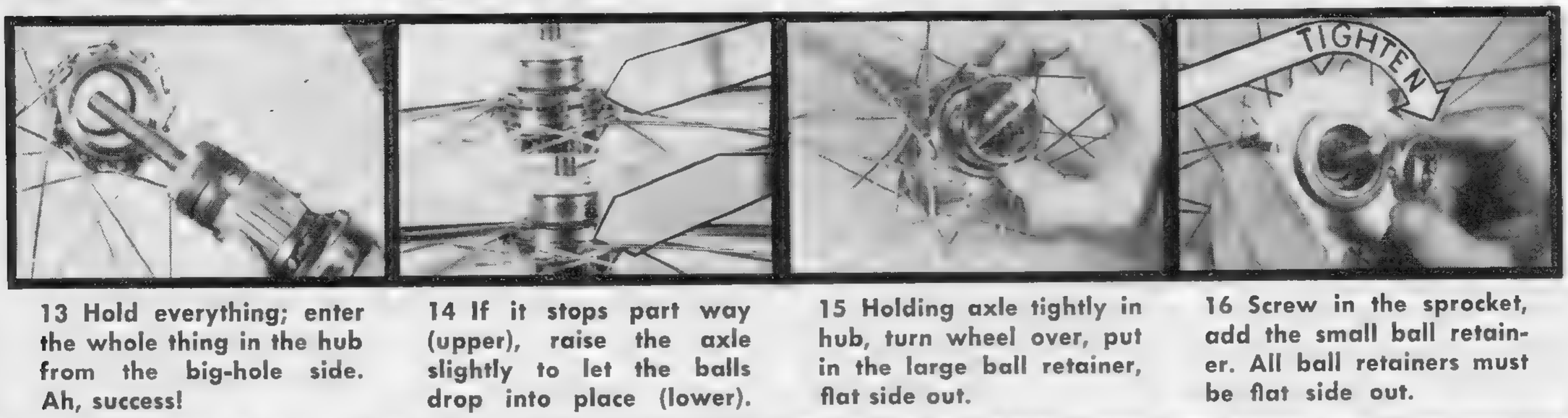


9 Put the clutch in the retarder unit. Did you grease the retarder? Tsk!

10 Add the expander and retarder to the axle. Line up the key slots.

11 Add the two keys, hold them in place. Extra fingers will be needed!

12 Add both brake shoes —hold them in place too. Oh—oh! What's slipping?



13 Hold everything; enter the whole thing in the hub from the big-hole side. Ah, success!

14 If it stops part way (upper), raise the axle slightly to let the balls drop into place (lower).

15 Holding axle tightly in hub, turn wheel over, put in the large ball retainer, flat side out.

16 Screw in the sprocket, add the small ball retainer. All ball retainers must be flat side out.

17 Add the cone, tighten it against the bearing with your fingers, unscrew it 1/4 turn.

18 Hold the cone so it can't turn, add and tighten the lock nut.

19 Take the wheel out of the vise. Does the axle turn freely with very slight end play?

20 If it clicks noticeably when pushed endways (end play) tighten the cone 1/16 turn. Keep at it.

Spokes and Rims

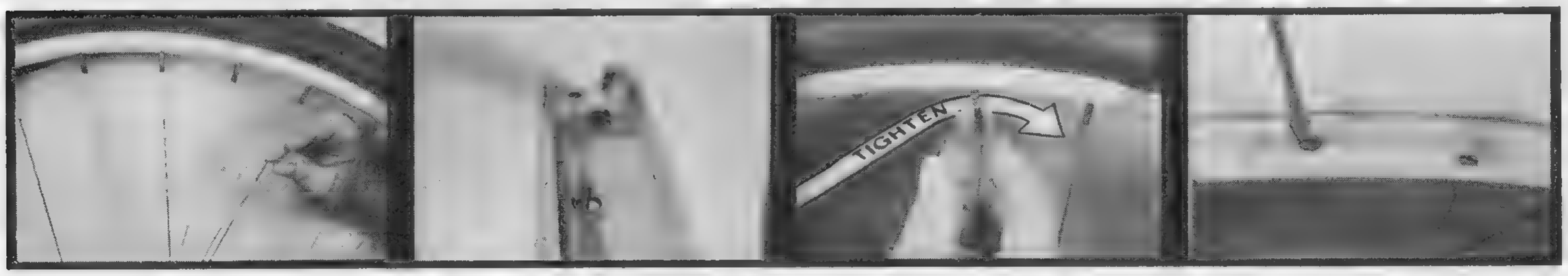
ADDING SPOKES

There is no particular trick to adding a few spokes. If the spoke is broken and the end can be unscrewed out of the nipple (the threaded part in the rim), then the new spoke can be added without deflating the tire. If the nipple is broken, or the spoke won't come out of it, deflate the tire, push it aside to uncover the nipple head and put in a new nipple. Be very sure the new spoke is the right length—check it by placing it beside one in the wheel. Entering a front spoke is simple—notice the pattern of spoke heads to show you which direction the spoke should go through the hub flange.

If you have a number of loose spokes, don't tighten them till you have crayoned the rim to find which ones need the most tightening—see next page.

1 To enter a rear wheel spoke on the sprocket side from the INSIDE face of the hub flange, line up the spoke hole, the slot in the sprocket, and space between brake arm and fork.

2 If the spoke must enter from OUTSIDE the hub, lead it through the sprocket slot, spoke hole, then above the intersection of the opposite spokes. See arrow.



3 Pull it through, flex it and lead it between other spokes to its nipple.

4 If the spoke pokes above the rim surface, cut off the extra length.

5 & 6 Screw the nipple onto the spoke with the spoke wrench. If the tire is off or deflated, it is easier to engage the slotted head of the nipple with a screwdriver.

REBUILDING WHEELS

You can send in your hub to a mail-order house or a bike repair shop and have a new wheel built on it—be sure to say what size. If you are willing to spend some time on it, try it yourself. If a wheel is to be rebuilt when installing a new coaster brake, for example, then 36 spokes of the correct length and nipples are required and all must be similar. The old spokes are first cut away, cutting them close to the hub. All the spokes are threaded through the hub in the direction required. When all the spokes are threaded into the flange, the whole thing is laid on a table with the spokes radiating out from the hub and the rim is laid at the ends of the spokes.

Then follow another wheel to get the pattern right; start the 9 spokes coming from one side of one flange into every fourth hole in the rim engaging the spoke by one turn of the nipple. Be sure that the set of rim holes is on the same side of the rim as the hub flange concerned. Then start the next set of 9 in their proper holes; be very sure that the pattern is right and that the spokes lie over or under the first lot as required, then follow up with the other two lots of 9 spokes each. At this stage all of the spokes will be entered in the rim and all held by one turn of the nipples

Now tighten all nipples by six turns each. If all the spokes were identical in length and all nipples were identical in their thread length, then the wheel could be made true by merely tightening all nipples the same number of turns; but in our experience, these parts are not identical and this system works only up to a certain point. After the total of 7 turns of the nipples, the spokes should still be on the loose side, at least most of them will be. Now proceed to tighten up nipples possibly one or two more turns each if they call for it, but in any case, the end of all spokes should be the same distance down in the nipple from the screwdriver slot. Work around the whole wheel to obtain this condition and if compatible, to obtain the same degree of tightness on the spokes. If you are musically inclined, the spokes should have a pitch about G above middle C.

Now test the wheel for roundness and freedom from wobble as described under "Truing a Rim" and correct it by the methods given. Simple wasn't it—or was it?

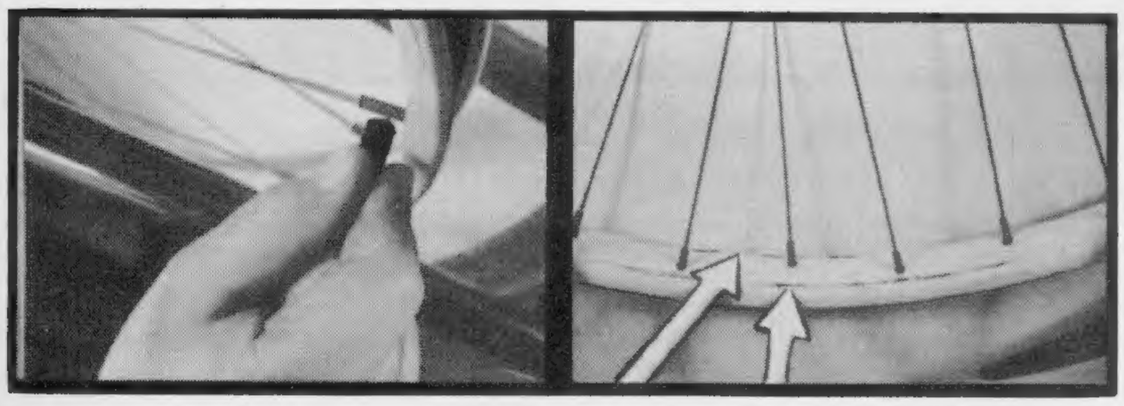
Truing a Rim

CORRECTING "OUT-OF-ROUND"

This is usually caused by someone tightening spokes without regard to what is happening to the rim. This nit-wit effort may also poke some of the spokes through the rim too far—puncture coming up!

When the wheel is not in a true circle, it has a hump or flat spot, usually both. As some spokes must always be loosened before any can be tightened, the flat spot must be found first, and its spokes loosened. Then the hump is found and its spokes tightened. The rim can move 1/8 inch radially for 7 turns of the spoke nipples. Flat spots and humps are shown up by spinning the wheel while holding a crayon or chalk near the proper place.

These operations will probably cause sideways warp, as quite a few turns of the spokes may be needed, and warp can be caused by quite a small adjustment (1/2—1 turn) of the spokes. Final adjustment for warp is therefore done last and has little or no effect on circular shape.



1 Locate the flat spot by crayoning the inside surface of the rim close to the nipples.

2 Markings on both sides occurring in the same place on the rim show a flat spot.

RIM ZIGS AND ZAGS IN GENERAL

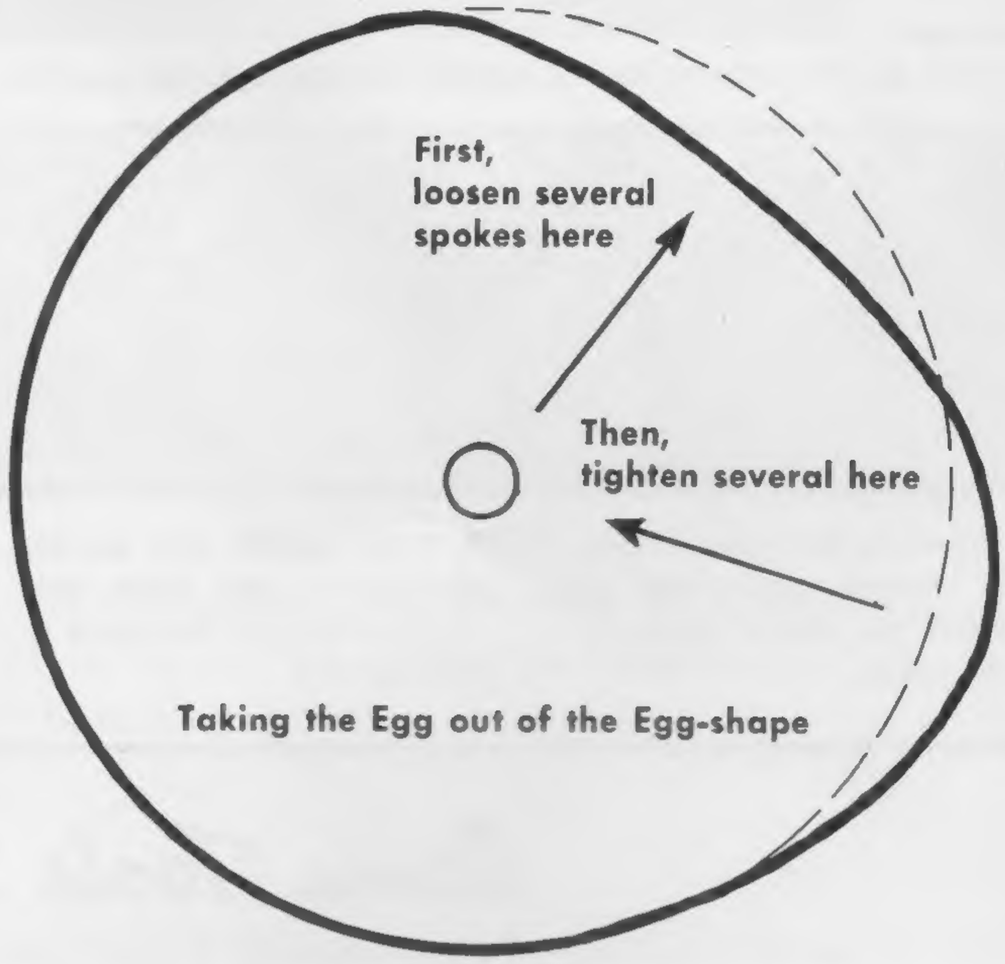
Once your spokes were all a bit loose—that didn't seem right, so you just tightened them—and, wow!—the wheel was so warped it would not run through the fork without rubbing. Or the time Bub left his bike behind the car in the driveway and—well—one wheel was certainly warped. Truing a wheel takes time, but it is not nearly as nasty a job as some others.

A wheel can be wrong in two ways. It can be out of round, egg-shaped, for example, or it can wobble from side to side. If the sideways warp is very bad, deal with it first, then with out-of-round, and then a final adjustment sideways.

Before you start, get a spoke wrench and about six spokes of the right length and nipples. Measure along the spoke from the rim surface to the spoke head in the hub.

Now take the wheel off, remove the tire, tube and rim strip, and put the wheel back loosely in the frame. An old front fork clamped in a vise makes a swell wheel holder for this job. Use a screwdriver for nipple adjustment if possible, otherwise use a spoke wrench.

You will find some spokes are rusted into the nipples and must be replaced. Cut the rusted ones near the hub so they come out easily.



3 Loosen all the spokes in the marked area, middle ones most.

4 Now find the hump by crayoning the outside of the rim, both edges.

5 If both marks show in the same part, a hump is indicated.

6 Tighten the spokes in the marked stretch, the middle ones most.

Mark the rim again (wipe off the first marks, or use a different colored crayon), and again loosen any flat spot, pull in any hump. Keep on till it's within 1/16 inch or better of a true circle. This tolerance can be seen in the greatest clearance between the crayon and the rim when the crayon is held so it just touches the remaining hump.

Some wooden rims object to being true circles, but proper tension on the spokes may flatten a hump in time. In any case, don't leave any spokes at such a tension that they are near the breaking point.

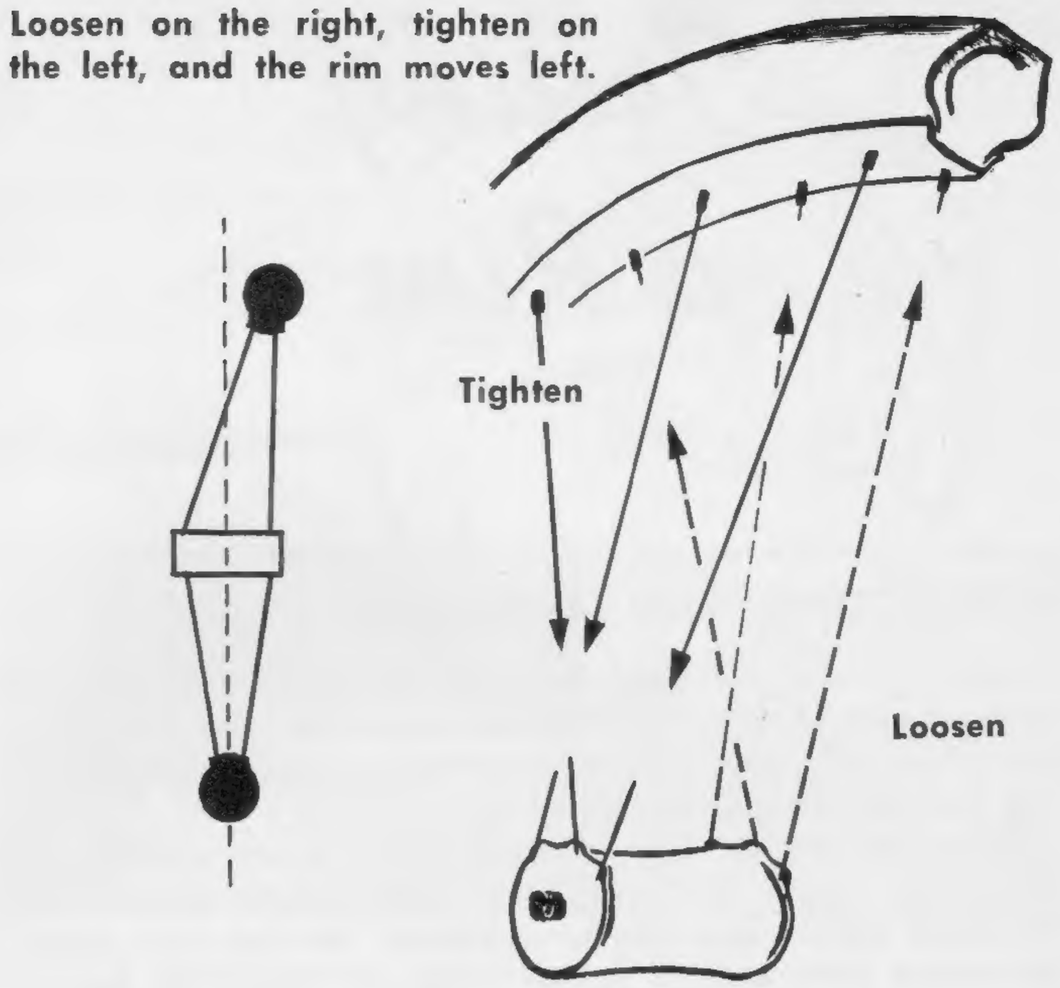
CORRECTING SIDEWAYS WOBBLE

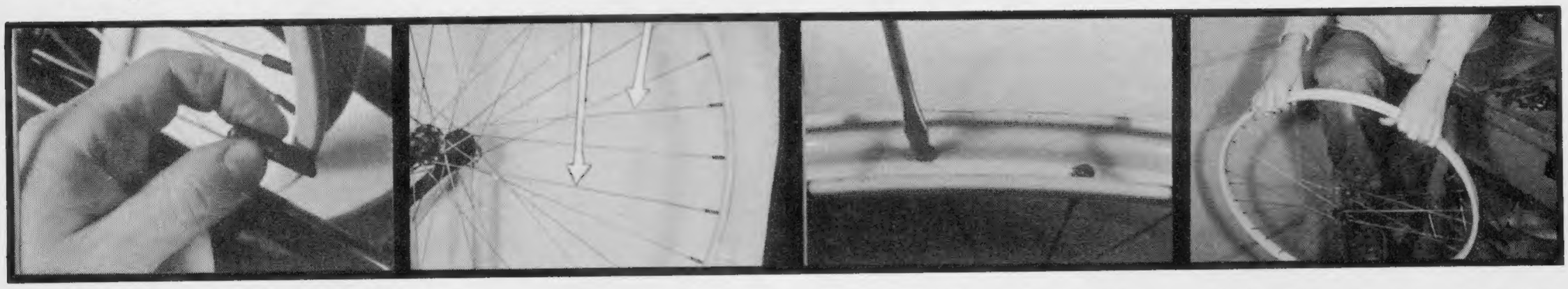
Sideways wobble is a common rim ailment. If the wheel will still run through the fork, we ignore it. But it is not really hard to put right. The idea is to locate the bumps by crayoning, loosen spokes on the bump side and then tighten on the other side. Theoretically, loosening spokes on one side one turn, and tightening on the other side one turn will shift a 26-inch rim about 1/8 inch sideways. So the middle of a bump 1/8 inch high should be so treated, tapering off to nothing for the spokes at the ends of the bump. Actually, the spokes are not usually found to be equally tight; there is no point in loosening a spoke already very loose, nor in tightening one already tight. So use that thing on your shoulders, one thing it's meant for is thinking. Use it also to decide which rim side actually has the bump—in general, short marks indicate it.

A bike wheel run over by a car may be salvageable if it is not squashed or sharply bent. But it takes "knee action" and considerable time. The result is not as strong as a new rim, as the spokes are at different tensions to hold the rim true.

About straightening a bent rim—if you overdo the knee action by having your hands too far apart, and a number of spokes are loose, the wheel suddenly snaps into a strange pretzel figure. This adds variety but not progress; but the wheel can be snapped back into shape without damage.

Let's go. Be sure to loosen spokes before tightening any.





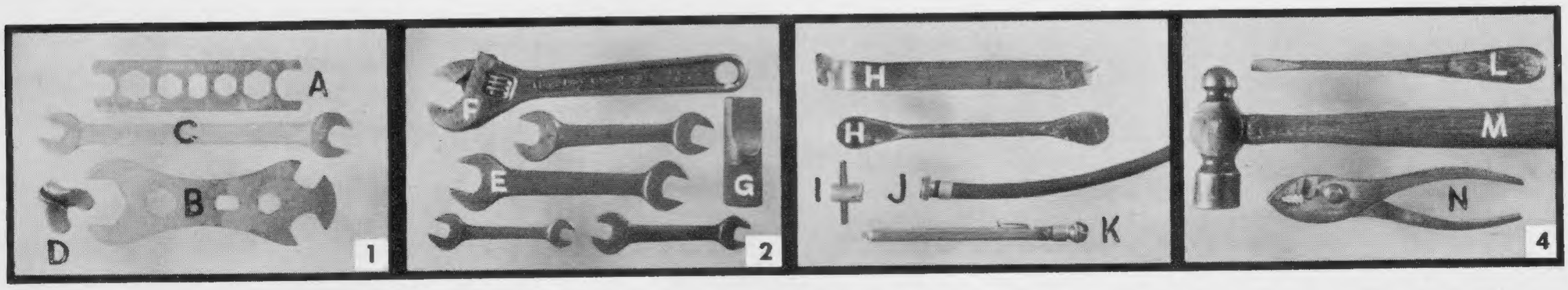
1 To show the bumps, spin the wheel and hold a crayon or chalk close to both sides.

2 Now loosen the spokes that go to the same side of the hub as the mark is on the rim.

3 And tighten the spokes on the other side. Keep at it until the wobble is 1/16 inch or less.

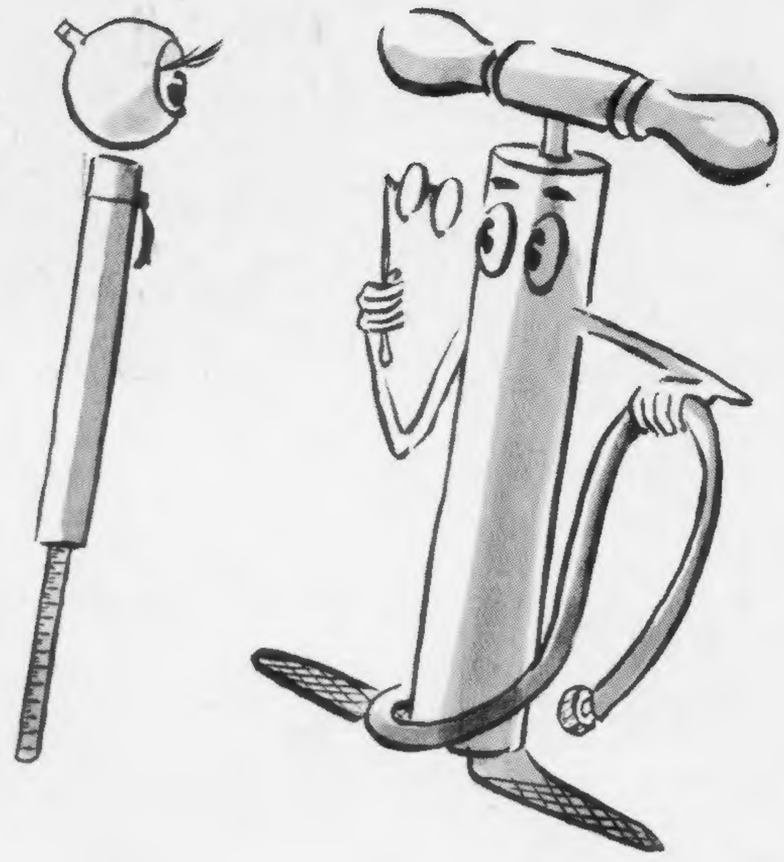
4 If the bump persists (check by crayoning), use the Knee Action method, as the rim is actually bent.

Some Tools You Will Need



1. The straight flat wrench (A) fits wheel cones and nuts, adjusts saddle and handlebars. The big space on the end of this one (B) fits the large nuts on some front forks, and some pedal crank nuts. Long, thin open-end wrench (C), 9/16 inch, for removing pedals. Spoke wrench (D)—to fit spoke nipples. 2. Set of open-end wrenches (E), from 5/16 to 11/16 inch for miscellaneous uses. Very handy. Adjustable wrench (F)—to fit things other wrenches won't. New Departure brake assembly tool (G)—for holding brake discs in place. 3 Tire tools (H), for removing lightweight tires. Valve tool (I), for removing valves, rethreading inside and outside valve stem threads. Output end (J) of a tire pump (exercise end not shown). Tire gauge (K)—get the 4 to 50-lb. range. 4 The Big Three in repairs—the screwdriver (L) (thin bladed) has lots of uses. Hammer (M) serves in chain repairs, fender undenting, etc. You can do everything with a pliers (N)—but don't! Leave hex nuts and bolt heads to wrenches. And don't forget the vise—with copper covers for the jaws.

There was once a sad sack who loved biking
But never found oil to his liking.
Now the cost of repair
Has him tearing his hair,
And his shoe leather sizzles from hiking.



EVERY SATURDAY

Give it the air!
Pump the tires to the recommended pressure:
Balloon 22-35 lbs. Lightweight 50 lbs. Single Tube 40 lbs.

EVERY MEMORIAL DAY AND LABOR DAY

Is your chain a daisy?
It won't be unless you dunk it in oil, let it drain overnight, blot and apply graphite. Skip the dunk if you're lazy, and squirt oil on the chain without taking it off the sprockets. If it crackles or squeaks, oil it oftener than twice a year. A good chain should be seen, not heard.
Clean and regrease the crank bearings.

Don't be a poor pedaler!
Squirt oil into the inner ends of the pedals. Spin them now and then. If they don't spin quietly, oil them oftener or repack with grease.

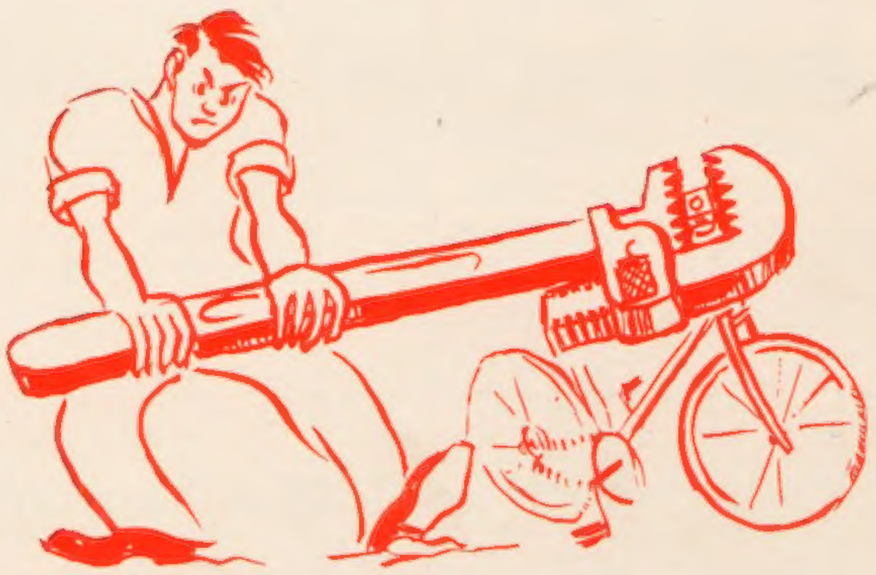
Do you go for extra gadgets?
Kick stands, caliper brakes, shock absorber bearings, speedometer cables, etc., need oil on working surfaces. You can skip the fox tail.

EVERY OTHER MEMORIAL DAY

Old clothes, and roll up your sleeves!
Clean and regrease the coaster brake, crank bearings, front wheel and front fork bearings, and pedal bearings. Grease these every year if you average more than five miles a day, or if you ride in hilly or dusty country.

How to Butcher Your Bike

TIGHTEN EVERYTHING HARD WITH A STILLSON WRENCH. ➡



⬅ **BE FORCEFUL IN REMOVING TIRES.**

**DON'T OIL ANYTHING—
MUD AND RAIN ARE BETTER.** ➡

DON'T BOTHER ABOUT ADJUSTMENTS.